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## THE DISEASES OF BOILERS.

Under this caption there appears in another part of this issue a fine article by Mr. F. S. Allen, who is chief engineer of the Hartford Steam Boiler Inspection and Insurance Company, of Hartford, Conn. This company occupies in America a place corresponding somewhat to that filled in England by the well-known British Engine, Boiler and Electrical Insurance Company, Ltd.

Commenting on Mr. Allen's article, the *Engineering Record*, of March 19 last, remarks editorially that "this is probably the most authoritative statement that has yet appeared concerning the usual defects of boilers, and deserves to be preserved by all owners of power plants."

Mr. Allen first reviews the common defects in the construction of steam boilers and makes some valuable suggestions for remedying the same. This part of the article may not at first sight appear of much importance to power-plant operators, but a little consideration will show that it is of the utmost value, inasmuch as "prevention is better than cure," for a dangerous accident may often be averted by noting an incipient defect which would ordinarily be overlooked, and Mr. Allen's remarks will show the uninitiated what to look for in this connection.

Further on, the author gives some instruction on the operation of steam boilers, with especial reference to feed waters and the deposition of scale. A noteworthy fact remarked by Mr. Allen, with regard to scale formation, is the effect produced in some waters by increasing the temperature and pressure at which the boiler is worked. In some instances, the author shows an increase of a few pounds causes scale to be formed which otherwise would not be precipitated, and an account is given of how this difficulty was overcome in a particular case.

Perhaps the principal value of the paper lies in its insistence on the importance of having everything of the best in the construction of the steam boiler; quoting again from the *Engineering Record* editorial referred to above: "While a satisfactory explanation of every failure has not been possible, enough has been learned to indicate very clearly a good many of the things which should not be permitted in boiler construction, and the value of the paper to engineers lies in the authoritative support it will give them when they insist on the best grade of material, workmanship and design."

## VACUUM CLEANING.

The introduction of vacuum cleaning within the last few years is bringing about a most desirable sanitary reform in domestic economy to which the attention of electrical men in general and of the central-station managers in particular might well be directed in view of the approach of spring house-cleaning time. Probably the worst feature of that annual upheaval used to be the cleaning of the carpets and rugs, although draperies and upholstered furniture were nearly as great a problem.

Before the invention of the carpet sweeper, the broom alone held full sway for cleaning carpets in place. The acknowledged absurdity of stirring up the dirt and dust from the floor covering to have it settle largely on the walls and furnishings of the room, combined with the physician's warning of the frightful unhealthfulness of the whole process, brought about the extensive replacement of carpets by rugs that could be more or less easily removed from the floor for cleaning. But when the cleaning of the rugs was done by beating them on a line on the back porch or in the back yard, although more thorough as a rule than when swept with a broom on the floor, it was but slightly more sanitary for the disease-carrying dust was scattered far and wide in a manner that should be regarded as little short of criminal where neighbors were closely adjoining. Fortunately in some of our more advanced communities this is positively prohibited.

With the carpet sweeper some improvement was achieved, but it removes the dirt from the surface only without affecting that in the interior of the carpet or rug; moreover it does not eliminate the scattering of some dust into the air of the apartment. One of the next attempts at sanitary cleaning of rugs was to remove them bodily to an establishment particularly fitted for cleaning them. In the large cities these places did considerable business for the cost of cleaning rugs was not much greater than by having it done by a hired man with a carpet beater. In some of these establishments a large motor-driven tumbling barrel is used and the dust drawn out at one end into a settling chamber; more of them now use the vacuum process.

Probably the first adaptation of vacuum cleaning was in the engine or motor-driven movable cleaning equipments that came up to a hotel or large apartment building and cleaned the floor coverings in the entire premises from attic to cellar. The experience with these outfits led to many improvements in vacuum cleaners. The most marked of these improvements are the making of some types of vacuum cleaners of small size, compact and light and therefore more profitable and less expensive, also in providing them with a vaiety of tools to adapt them for the cleaning of furniture, draperies, floors, walls and even clothing. Both these features are making the vacuum cleaner a general household convenience of the greatest utility.

What is a luxury today becomes a necessity tomorrow. The application of electricity has converted more luxuries into necessities during the last thirty years than any other single agent. Electricity is now making the vacuum cleaner a household necessity just as it has recently made the electric flatiron indispensable. The electric vacuum cleaner has even more points in its favor than the electric flatiron, for it not only adds to the comfort of housework, but it greatly diminishes its cost as well as the wear and tear on the furnishings, while above all it promotes the health of the entire household. The last point alone should be regarded as so important as to induce the general use of vacuum cleaners in even the most moderate homes and the ability to use them should be an added reason for having every home wired and connected for electric service.

To aid in the more rapid introduction of vacuum cleaners in our homes central stations can adopt plans similar to those that proved so effective in the introduction of the electric flatiron. The payments for the outfit itself can be extended over one or even two years and added to the monthly bills, as is done so successfully by gas companies in selling gas stoves and ranges. To reduce the initial cost still further a number of neighbors can club together to purchase a vacuum cleaner in common that can be used on stated days in each home. A central-station company can even do a good business by loaning its vacuum cleaners to its patrons at a moderate sum per day. The owner of an apartment building can well afford to have a vacuum cleaner to lend to his tenants on different days under the guidance of his janitor. As a matter of fact this is now an admitted feature of several new apartments in Chicago.

It is not necessary to dwell at length on the larger uses of vacuum cleaners. In large buildings and institutions they are generally installed permanently in the basement, from which pipes are run to every floor whose flexible hose may be connected. A use as yet untried, but that is much to be desired and doubtless to be realized, is for street cleaning. The common rotary street sweeper is a public nuisance even to those who may go on the sidewalk long after the sweeper has passed by. Our busiest streets are those provided with trolley lines. For a reasonable compensation the street car companies would gladly provide the power to operate electric vacuum street sweepers. This problem is well worthy of serious study, for its solution will result not only in economy in the sweeping costs, but produce a cleaner and quicker job and one that will not be a menace to the public health.

While we are experimenting in new fields of usefulness for the vacuum cleaner, we may well improve the time by exploiting its use to the fullest extent in the many fields already opened to it. As already pointed out, the greatest field for it is in our homes and every effort in this direction is a noble effort for health, comfort and cleanliness.

## TELEPHONE RATES IN LARGE CITIES.

For over two years the Massachusetts Highway Commission, through its consulting engineers, D. C. and W. B. Jackson of Boston and Chicago, has been investigating the rates in force by the New England Telephone and Telegraph Company, particularly in Massachusetts and at Boston. A feature of this work which has attracted widespread attention was a complete appraisal and valuation of the company's property, carried out on a more detailed basis than ever before in the history of the telephone industry. Following the appraisal, the engineers of the Commission made an exhaustive study of the traffic, revenues, and service conditions of the company, and a report has just been filed at the offices of the Board which represents probably the most searching analysis of telephone rates upon an engineering basis ever conducted.

The report recommends a revision of rates involving an estimated yearly reduction in revenue amounting to between three and four hundred thousand dollars; the subdivision of the existing territory known as the Boston and Suburban division into districts or zones determined by the manifest needs of the great body of average users of the telephone rather than by the special desires of a few large users or by the extraordinary requirements of some others; that each suburban district shall comprise a particular exchange and all its adjoining exchanges, from one point to another within each district there being no toll charge to flat rate subscribers and no initial charge greater than five cents for a call from any measured service or pay station telephone; limitation of party lines to two subscribers, with divided ringing; a five-cent toll charge between stations in the metropolitan district and points not over seven and one-half miles from the Boston Post Office, and a similar toll charge to any exchange outside a subscriber's district but within a seven and one-half mile radius; a reduction in unlimited extension set rates and recommendation that excess coin box deposits be balanced on a yearly basis.

The report contains a wealth of engineering data which must be passed over here, one of the most interesting being that the average charge per message by the company in the Boston and suburban district is 3.46 cents, there being 130,000,000 calls per year. The district has an area of 432 square miles, and covers some forty municipalities, with 63,927 suburban and 48,789 metropolitan instruments. In such an area the rates to be adaptable for all the reasonable uses to which a telephone may be put within a territory supporting such a multifarious and contrasted population must afford the utmost of convenience, rapidity and accuracy of service at a fair price to large business users, and at the same time afford some adequate plan by which the smaller users may obtain good service at prices proportioned to their use. The importance of good service for the smaller users in affording stability to the telephone service has not been adequately recognized in most arrangements of telephone rates. The report points out that it is substantially impracticable to make rates for good service reasonably within the pocket-book of small users as long as flat rate unlimited service is provided over so large an area.

The problem of adjusting rates so that they will distribute costs equitably between the several classes of subscribers is a very difficult one. One part of the investment is substantially independent of the messages originated by the subscribers and is fairly determined for each class of service by the apparatus which must be provided for the purpose of being prepared to give the kind of service required in that class but of a delayed character whenever several subscribers require service at one time. The other part is the remainder of the apparatus, which changes approximately in ratio with the number of messages originated by the class of service, and includes the plant required to enable the telephone company to give quick service to each customer whenever he makes a call. The latter part of the investment of a telephone company for flat rate service in a large American city is commonly large compared with the first part. American telephone service differs remarkably in this respect from much foreign service. The price of service must cover the costs entailed by the investment, like interest and depreciation of plant, which latter must be overcome by reconstruction, and also all current costs including current repairs, operating and administrative expenses, parts of which are dependent on use and parts on investment. The engineers compute that the minimum annual sum that the telephone company must receive to meet interest and expenses entailed by the readiness-to-serve and the service-rendered investment in the metropolitan zone is practically $20 per year for the average subscriber to a four-party coin box telephone, $35 to the subscriber to a single party measured rate business telephone, and $80 for the average subscriber to a single party flat rate business set.

The report concludes that the proposed zone system affords an opportunity to start a genuinely scientific system of rates in the Boston and Suburban district, distinctly reducing the charges to the small user and relieving the large user who is not subjecting his telephone service to over-use from excessive charges which he now carries on account of being classified with a relatively few excessive users. The plan bids fair, if adopted, to stimulate an additional growth of the telephone system of Boston, and may be gradually extended so as to improve the telephonic relations throughout the state. Whatever may be the action of the Board upon this matter, the presentation of such a report sets a new standard for engineering co-operation in the work of public utility commissions, pointing to a larger influence of the electrical engineer in questions of public administrative policy than has heretofore been practised.

### N. E. L. A. Convention at St. Louis.

Present indications are the coming convention of the National Electric Light Association, to take place at St. Louis, Mo., from May 23 to 28, will be one of the best that has ever been held. Reports from the secretary of the exhibition committee indicate that exhibition space has been taken up more rapidly than in previous years. With the exception of perhaps a dozen sections the available space has been subscribed for.

The present list of exhibitors is as follows:

Star Electric Concern, 74 Cortlandt street, N. Y.
Wagner Electric Manufacturing Company, 100 Broadway, N. Y.
Simplex Electric Heating Company, 201 Devonshire street, Boston, Mass.
Pittsburgh Transformer Company, Pittsburgh, Pa.
Allis-Chalmers Company, Milwaukee, Wis.
Century Electric Company, Nineteenth and Olive streets, St. Louis, Mo.
Federal Electric Company, Lake and Desplaines streets, Chicago.
General Electric Company, Schenectady, N. Y.
The Ricker Manufacturing Company, 239 North Water, Rochester, N. Y.
Columbia Meter Company, Indianapolis, Ind.
Philadelphia Electric and Manufacturing Company, 1228 North Thirty-first street, Philadelphia.
Central Station Development Company, Cleveland, Ohio.
The Tungstolier Company, Cleveland, Ohio.
Fort Wayne Electric Works, Fort Wayne, Ind.
Duncan Electric Manufacturing Company, Lafayette, Ind.
Minerallac Electric Company, 139 Adams street, Chicago.
G. & W. Electric Specialty Company, 6408 Jackson Park avenue, Chicago.
*Popular Electricity*, Monadnock Block, Chicago.
Westinghouse Companies, Pittsburgh, Pa.
National Electric Lamp Association, 4411 Hough avenue, Cleveland, Ohio.
Sangamo Electric Company, Springfield, Ohio.
American Electric Heating Company, Detroit, Mich.
Standard Underground Cable Company, Westinghouse Building, Pittsburgh, Pa.
W. N. Matthews & Brother, 219 South Second street, St. Louis.
ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, Marquette Building, Chicago.
H. W. Johns-Manville Company, 100 William street, N. Y.
Hart Manufacturing Company, 156 Pearl street, Mass.
Monolithic Conduit Company, St. Louis, Mo.
W. J. Jeandron, 20 Vesey street, N. Y.
Fibre Conduit Company, Orangeburg, N. Y.
Diamond Rubber Company, Akron, Ohio.
Metropolitan Engineering Company, 1250 Atlantic avenue, Brooklyn.
Moloney Electric Company, St. Louis, Mo.
Electric Storage Battery Company, Allegheny avenue and Nineteenth street, Philadelphia.
The Waverly Company, Indianapolis, Ind.
Western Electric Company, 463 West street, N. Y.
*Electrical World*, 239 West Thirty-ninth street, N. Y.
Dearborn Drug and Chemical Company, 299 Broadway, N. Y.
Commercial Electric Supply Company, St. Louis, Mo.
Frank Adams Electric Company, St. Louis, Mo.
Dossert & Company, 242 West Forty-first street, N. Y.
General Vehicle Company, Long Island City, N. Y.
Wesco Supply Company, Seventh and Clark avenues, St. Louis.
D. & W. Fuse Company, Providence, R. I.
*Electrical Record*, 114 Liberty street, N. Y.

### American Institute of Electrical Engineers.

The regular April meeting of the American Institute of Electrical Engineers will be held in the auditorium of the Engineers' Building, 33 West Thirty-ninth Street, New York city, on Friday, April 15, 1910. The meeting is to be held under the auspices of the Educational Committee of the Institute. Dr. Samuel Sheldon, professor of physics and electrical engineering in the Brooklyn Polytechnic Institute, will present a paper entitled "Education for Leadership in Electrical Engineering."

### Tungsten Lamps with Drawn Filaments.

The principal difficulty so far experienced in the manufacture of tungsten and other lamps using highly refractory metal for the light-producing element, has been the making of the filaments. This has hitherto been effected by the sintering process, in which the metal thread has been made by first extruding a paste containing the metal in a fragmentary condition, and then expelling the binding material and at the same time sintering or welding the metal fragments together by the passage of an electric current. The filaments so made, while serving their purpose in quite a satisfactory manner, are obviously not so well formed as wire made by drawing through dies.

This difficulty has now been overcome, and almost simultaneously in the United States and in Europe.

From Schenectady, N. Y., comes a report that the Research Laboratory of the General Electric Company (which is under the direction of Dr. W. R. Whitney), with the aid of a new kind of electric furnace specially designed for the purpose, has after considerable research discovered a method of producing pure metallic tungsten of great ductility, which can be drawn into exceedingly fine wires of great strength and ruggedness.

In England, the well-known firm of Siemens Brothers Dynamo Works, Ltd., has announced within the past week or so that it will shortly place on the market a tungsten lamp with drawn filaments, under the name of the "One-watt," a name significant of the extreme efficiency of the lamp in question.

These announcements from reliable companies denote a great advance in the manufacture of incandescent lamps, and further particulars will be eagerly awaited by all concerned.

### Electrification of Pennsylvania Railroad Terminals.

In the biographical sketch of the career of Lewis B. Stillwell, published in the issue of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for March 26, credit is asigned to Mr. Stillwell for the plans for the power house and the electrification of the Pennsylvania Railroad terminals and subways in New Jersey and under the Hudson River. It was the intention in this connection to refer to the tunnels of the Hudson & Manhattan Railway Company between Jersey City and New York, and Hoboken and New York, the equipment of which has been planned and installed under the direction of Mr. Stillwell. The Pennsylvania Railway terminal work is being carried on by Westinghouse, Church, Kerr & Company, under the direction of George Gibbs, chief engineer of electric traction of the Pennsylvania Terminal and Tunnel Railroad Company. This incorrect statement was brought to our attention by Mr. Stillwell.

### F. X. Cleary Appointed Advertising Manager of Western Electric.

Announcement has recently been made that F. X. Cleary has been appointed advertising manager of the Western Electric Company. Mr. Cleary has been with the Western Electric Company for about twenty years and has held important positions connected with the execution of sales campaigns for the company.

Under Mr. Cleary's direction the advertising of the Western Electric Company, which has been so successful in the past, will be conducted and extended along the same general lines.

Signatures of 18,759 voters have been placed on a petition before the Common Council of Detroit, calling for a popular vote on the question of municipal ownership of the street railways there.

## Convention of the Minnesota Electrical Association.

*(By Special Telegram.)*

MINNEAPOLIS, MARCH 29.—A representative gathering of central-station men from all points of the state marked the opening to-day of the third annual convention of the Minnesota Electrical Association.

President H. J. Gille in his address which followed the reports of the various outstanding committees reviewed the progress being made in the electrical industry, particularly the improved engineering and commercial methods being used by central stations. The question of water power was fully discussed and several important recommendations and suggestions made. He also recommended the construction of an electrical building at the Minnesota State Fair grounds.

The afternoon session was opened with the presentation of a paper by R. W. Clark, of the Minneapolis General Electric Company, entitled, "Developing Business." This paper discussed in general such commercial, financial and engineering aspects of central-station business as are presented from the viewpoint of development.

A paper on "Street Lighting" was presented by J. R. Cravath. Mr. Cravath outlined suitable street lighting systems for small towns and explained how they can be made profitable to the central station.

This was followed by a paper on "Accounting," by Thomas Pitts. This paper gave the details of a comprehensive system of bookkeeping for small central stations.

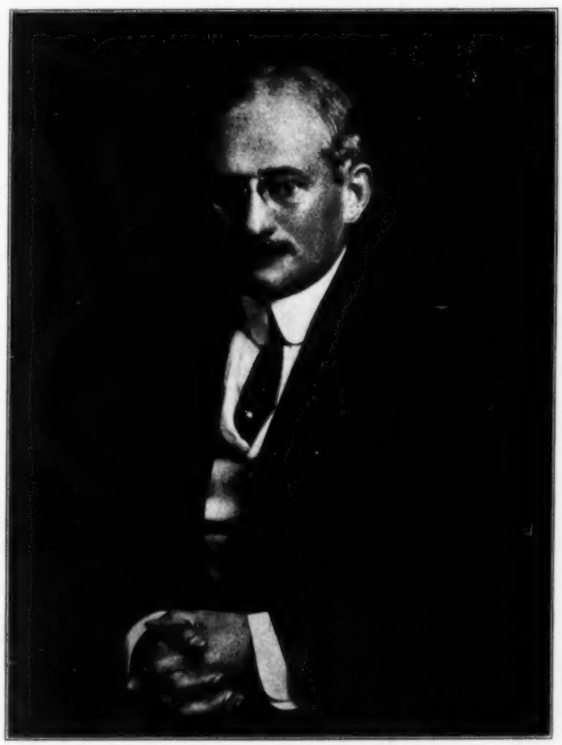
The experiences of a central station employing gas engines as prime movers were recounted interestingly in a paper on "Gas Engines" by Alfred Horne.

Brief but spirited discussions followed the reading of each paper.

In the evening an informal smoker was held at which Prof. M. M. Wood lectured on "Gyroscopes." Professor Wood explained the principle of the gyroscope and demonstrated the apparent paradox of the resolution of forces which has attracted so much attention lately.

## George A. McKinlock.

It is twenty-three years since George Alexander McKinlock, whose portrait appears on this page, went into Chicago and established the Central Electric Company. He was a thorough-going business man and an enterprising student of commercial ways, and he saw at that time a great opportunity for a central house for the distribution of electrical supplies to the fast growing electrical industry. It is said that the business was a success from the beginning, but this was due not to any accident of natural development, but to the careful and courageous meeting of exigencies as they developed. Mr. Kinlock developed with his business, and he stands as a leader in this field today.



GEORGE A. McKINLOCK,
A Conspicuous Leader in the Electrical Supply Business of the United States.

Mr. McKinlock is president of the Central Electric Company, and although a young man, it might be said without fear of controvention that he has trained more young men into successful business standing than any other single individual in this industry.

Mr. McKinlock was born at Oswego, N. Y., December 27, 1857. He was a son of John and Margaret N. (McCormick) McKinlock. He was educated in the public schools, and his business career began practically in 1877, when he was made manager of the American District Telegraph Company, at Detroit, Mich. He was later cashier and auditor of the Bell Telephone Company, at Detroit, Mich., retaining this connection until 1886. He went to Chicago in March of 1887, when the Central Electric Company was organized.

Mr. McKinlock takes an active part in the civic and social life of Chicago, and although a busy man and a great traveler, he is a most delightful entertainer at his beautiful residence on Prairie Avenue, Chicago.

## The Electric Generating Plant at Nairobi, British East Africa.

In a recent issue of *The Electrical Review*, of London, England, are given some details of the plant of the Nairobi Electric Power and Lighting Company. Nairobi, British East Africa, which part of the world has latterly been brought into the limelight, so to speak, on account of the publicity caused by Colonel Roosevelt's expedition.

Water is obtained from the River Reivera, across which a concrete dam has been placed. The water is conveyed by wooden fluming, and three thirty-six-inch steel pipes to turbines flexible coupled to E. C. C. 10,000-volt fifty-cycle three-phase alternators, and the energy is transmitted at this pressure over aerial copper lines, a distance of fourteen miles, and stepped down to 2,500 volts for distribution in the town. This distribution is also by overhead wires, and a further reduction in pressure, to 200 volts, is made for power and lighting in the center of the town.

## National District Heating Convention.

The National District Heating Association will, according to the decision of the executive committee, meet at Toledo, Ohio, on June 1, 2 and 3. The following subjects will be discussed:

Radiation; factors that enter into the determination of costs in central-station heating; advantages of hot water over steam; advantages of steam over hot water; the central station operated purely as a heating station without the adjunct of electricity or other industry; costs. There will be other papers, the subjects of which are not yet announced.

### W. M. McFarland Joins Babcock & Wilcox Company.

Walter M. McFarland, who has been associated with the Westinghouse Electric and Manufacturing Company since January 1, 1899, has resigned to accept an official position with the Babcock & Wilcox Company.

Mr. McFarland has occupied the office of acting vice-president for the Westinghouse Electric and Manufacturing Company for a period extending over ten years. In this capacity he has had official supervision of the large contracts of the company, as well as being the advisory head in all the cooperative movements of the company with the associated Westinghouse companies involving literature, advertising and exhibition work.

As a frequent representative of the Westinghouse companies at important meetings of engineering societies and at conventions, he is well known, and he has long been looked upon, by his company at Pittsburg, as the official host. In the latter capacity he has come into contact with many distinguished engineers and other guests from all parts of the world. His broad experience in the activities of his company and in engineering matters in general, attained through his previous work in the United States Navy, and his personal acquaintance with men of public affairs, entirely fitted him for duties of this character. In his connection with the Westinghouse Electric and Manufacturing Company, he has done much to systematize and improve the work of the departments with which he has come into contact, and has through his personal qualities won the confidence and respect of the large number of employes looking to him for guidance and direction.

Mr. McFarland was born in Washington, D. C., in 1859. His education was received in the public schools of Washington, the preparatory department of Columbia University and the United States Naval Academy. He entered the latter institution as a cadet engineer in 1875, and in 1879 was graduated second in his class. In 1881 he was commissioned as assistant engineer; in 1891 as past assistant engineer, and in 1898 as chief engineer. He was the youngest officer for more than twenty years to have reached the latter grade. When the "Personnel Board" was assembled by the Secretary of the Navy in 1897, Mr. McFarland had the honor of acting as the sole sponsor for the younger men of his corps. From the first he was one of the most active and effective supporters of the amalgamation scheme, the recommendation of which was the result of the deliberation of the board. As a member of the board he had the special confidence of its presiding officer, Theodore Roosevelt, then assistant secretary of the navy, and he proved a powerful advocate of the measure before the congressional committee, drawing from them the comment that he was the best posted man that they had ever examined. In 1899, after the passage of the "Personnel Bill," he was commissioned lieutenant, and the same year resigned to enter the employ of the Westinghouse Electric and Manufacturing Company.

After having had wide experience in

WALTER M. McFARLAND.

sea service, he was detailed for service in the Bureau of Steam Engineering in 1882. From 1883 to 1885 he was detailed from the Navy as assistant professor of mechanical engineering at Cornell University, and during the years 1885 and 1886 he was occupied with the inspection of machinery then building, and with work on preliminary design for proposed vessels. From 1889 to 1894 he was again attached to the Bureau of Steam Engineering.

This experience, together with his experience in the affairs of the Westinghouse Electric and Manufacturing Company, admirably fit him for the duties which his connection with the Babcock & Wilcox Company will impose upon him.

Mr. McFarland was vice-president of the American Society of Mechanical Engineers in the year 1907, and at the present time is vice-president of the Society of Naval Architects and Marine Engineers. He is also a member of the Engineers' Club of New York, Duquesne Club of Pittsburg, the Army and Navy Club of Washington, and the Army and Navy Club of New York.

He has been a frequent contributor to the technical press, and his papers on engineering topics have won for him an enviable reputation as an engineer of broad experience and advanced ideas.

Mr. McFarland will be located at the general offices of the Babcock & Wilcox Company in the Singer Building, New York city.

### Prizes for Papers on Central Station Rates.

The Central Station Development Company, of Cleveland, Ohio, has announced a contest for the best solution of the rate problem by central station men, and offers prizes amounting to $1,500.

The Central Station Development Company wishes to receive from central station men as many clearly written, comprehensive explanations or treatises on the subject of methods of charging and central station rates as possible.

The contributions must be submitted with the understanding that they will be entirely the property of the company if it elects to purchase any one of them for the nominal price of $1. In order that a contribution may receive prize consideration it must cover comprehensively every application of central station activity which might be embodied in the particular system. The rate system suggested should completely cover the use of light equipment, motors, rectifiers and all sorts of special or regular service.

Only those directly connected as employees or in charge of central stations and municipal plants will be considered eligible to compete for the prizes. All solutions of the problem must be based upon the principles outlined in the recent paper by S. E. Doane, chief engineer of the National Electric Lamp Association, entitled "The Cost of Light."

All solutions must be submitted by or before June 15. A committee of five of the leading central station men of the country will pass upon the solutions submitted, to determine those who shall be entitled to the different awards. There will be 21 awards as follows: 1 prize of $500; 2 prizes of $250; 2 prizes of $100; 5 of $20, and 10 of $10.00.

# Electricity in a Modern Infirmary.

## Details of the Electrical and Mechanical Installation in the New Cook County Infirmary.

There will shortly be opened at Oak Forest, Ill., a new county infirmary which will be a model institution in every respect. It consists of a large group of buildings on a farm of 255 acres, situated in a pleasant agricultural district about twenty miles from the business center of Chicago, beyond reach of the smoke and annoyances of the manufacturing district. The site is one of the highest in the county and is easily drained and adapted to landscape gardening.

The buildings are located in an oak grove on the highest ground on the west end of the tract. The remainder will be reclaimed and farmed, the lowest portion being converted into an artificial lake.

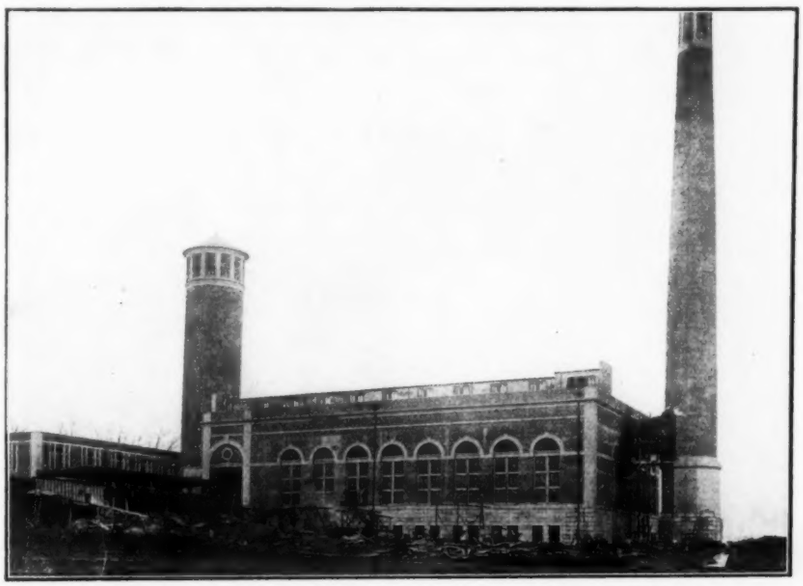
The buildings are laid out on the block plan, the cottage system being followed in the homes for the inmates. In the building scheme the buildings for administration service and general purposes are grouped near the center and the homes for inmates located on either side. The buildings are laid out from the two main axes. Along the axis which runs approximately north and south, the homes for inmates are arranged in two rows facing each other with an open space of 150 feet between. This open space will be converted into a broad lawn with a driveway around it lined with trees.

At the intersection of the axis and the center point of the group is the chapel. The space around the chapel will be laid out in a large garden which will be enclosed by connecting covered corridors which lead to the general buildings along the east and west axis.

On this axis at the west or approach side are the receiving and administration buildings, and beyond, the general hospital on one side and on the other the nurses' and hospital officials' homes, with a lawn and trees between. At the east end of the group beyond the chapel are the large dining hall, laundry, workshop, bath house, homes for irresponsibles, and the power house. Outside of the general group are several isolation hospitals, the morgue, and a number of individual farm buildings.

No building is more than two stories high, except the administration building, the workshop and a portion of the general hospital. Beside the covered walks connecting the buildings already referred to, there are pleasant walks and driveways. The buildings are constructed with steel frames, and concrete floors and roofs. Red and gray brick is used, with terra-cotta trimmings.

The first of the general buildings reached in approaching the central group by the main driveway is the administration building. This building is three stories high and 50 by 100 feet in plan. On the first floor are the principal offices of the infirmary, offices of the medical superintendents, head nurses, etc. There is also a dining room for this staff, and on the second floor their sleeping and living rooms. The third floor contains sleeping rooms for the domestics.



GENERAL VIEW OF POWER PLANT, COOK COUNTY INFIRMARY.

Directly in the rear and in connection with the administration building is the receiving building, the purpose of which is the examination and preparation of new arrivals for admission. This building is 50 by 100 feet in plan, and two stories high.

The general hospital is two stories high, and has accomodations for 188 patients. The wards lie north and south, and with exposure on east, south and west so as to get the maximum of sunlight and air. In addition to these general wards the building contains small wards for special treatment, an operating room, sun parlors, etc. The building is equipped according to the best known practice.

The nurses' home on the opposite side of the parking from the hospital is a roomy building containing living and recreation rooms. The chapel, which is built after the old English style, is simple and attractive in design, and seats 375 persons.

Beyond the chapel going toward the rear in the main group is the general dining hall. This building will seat 660 persons in its dining hall and in the rear contains a bakery, kitchen, and store-rooms in which the applications of electricity play an important part.

Back of the dining hall is the laundry building, workshop and the general bath. The laundry building is 57 feet by 138 feet, and is arranged in the most improved manner for receiving, handling and delivering linen, and is equipped with all modern appliances for such work.

The workshop is three stories high and contains shops for carpenters, mattress makers, painters, tailors, cobblers, broom makers, and furniture makers. On the second floor is a billiard room

and club room with all modern fittings. The top floor provides sleeping apartmenst for twenty men. All of these buildings are connected by covered corridors constructed of red brick and terra-cotta.

The power house is situated at the extreme east end of the east and west axis and covers a space of 102 by 160 feet. The building is a modern steel, fire-proof structure, constructed of brick with cement floors and roof. The general plan view is shown in an accompanying illustration. No effort was spared in making it a model of its kind, and as a result it is built on the broad and up-to-date lines which are characteristic of the entire institution.

The facilities for handling coal and ashes are elaborate, this being done automatically so far as possible. Coal is brought in from the main line of the Rock Island Railroad on a spur track running directly into a train shed which may be seen at the east end of the power house. Cars entering this train shed run over a 150-ton, forty-foot standard track scale installed by the Buda Foundry and Manufacturing Company, Harvey, Ill., and, being weighed, pass over a receiving coal hopper located in the upper part of the coal crushing pit and are emptied. By means of a reciprocating feed operated by a 3-horsepower Westinghouse motor, the coal is then fed into a crusher driven by a twenty-five horsepower Westinghouse motor. It is then conveyed to the east end of the power house and emptied into seven main hoppers which discharge, by means of wrought-iron spouts into the hoppers of the stokers. These chutes are provided with cylindrical valves which regulate the supply of coal to the stoker hoppers.

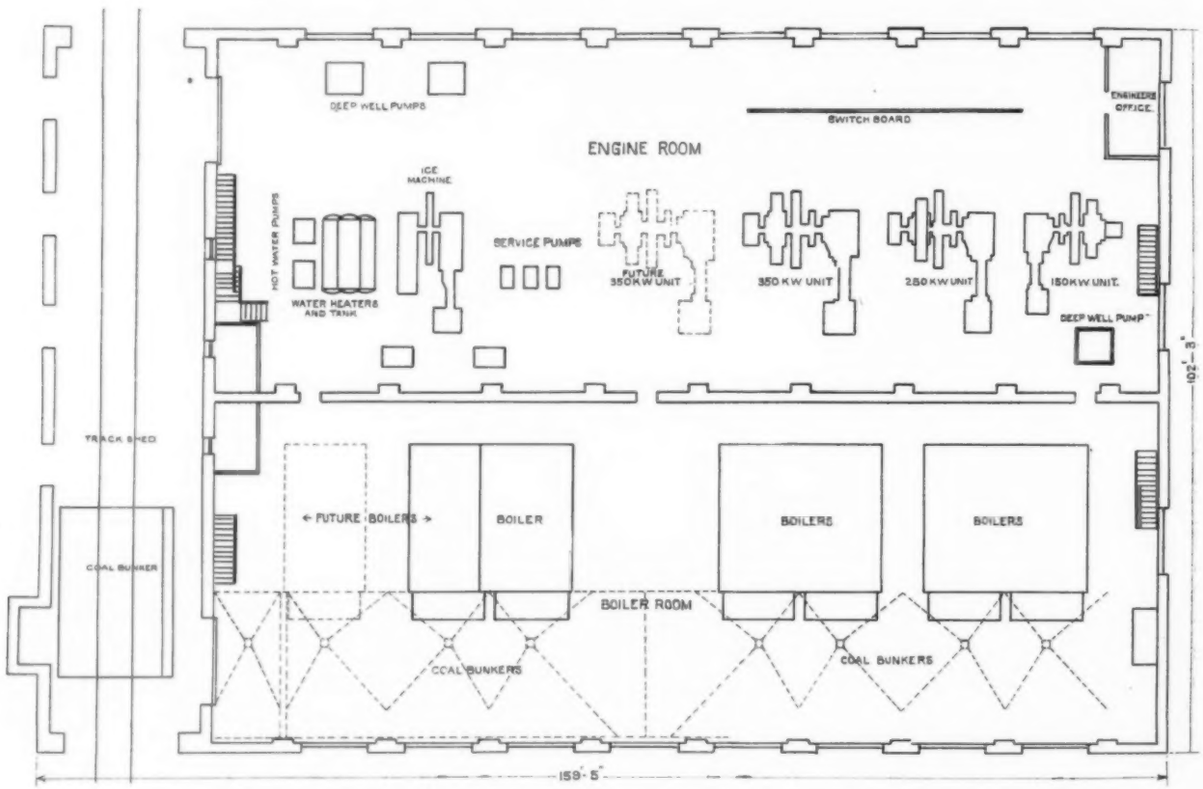
The ashes are conveyed from the ash pits in the basement directly under the furnaces, by means of conveyors operated by a 15-horsepower Westinghouse motor, to two hoppers above the train shed. From here they are dumped into cars on the spur track and hauled away. There is also provided an extra ash hopper which discharges into a spout protruding out of the side of the power-house so that cinders may be taken away by wagon for filling-in purposes about the grounds.

There is also provided a range-coal hopper which empties into a conveyor and is then elevated to a hopper above the train shed from where it is distributed into wagons for domestic purposes. This latter conveyor is operated by a three-horsepower Westinghouse motor. All coal and ash handling machinery was installed by the Webster Manufacturing Company, Chicago, Ill.

The boiler room installation includes five 350-horsepower water-tube boilers, in single settings located in a row, supplied by the E. Keeler Company, Williamsport, Pa. These boilers are equipped with the latest regulator apparatus, including Gould water columns with high and low water alarms, and Gould regulators for the boiler feed. Each boiler contains 174 water-tubes eighteen feet long, and the total heating surface of each is 3,615 square feet.

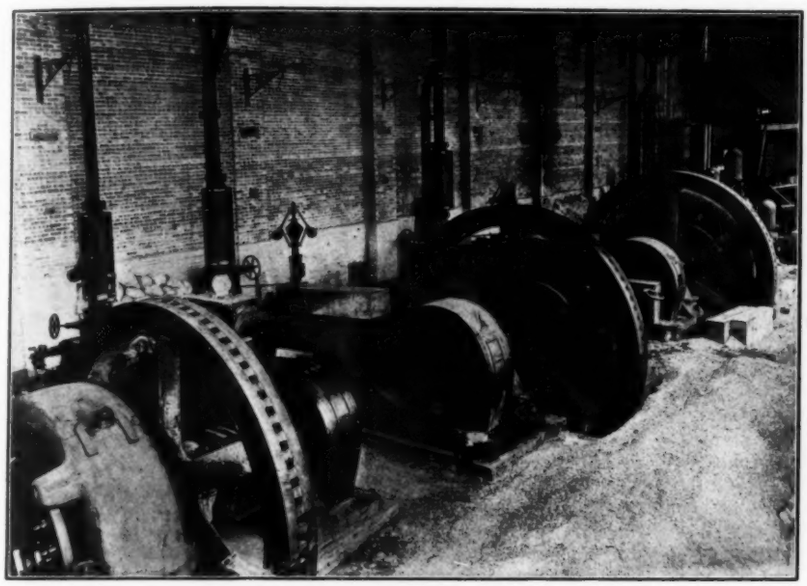
The boilers are provided with chain grate stokers supplied by the Illinois Stoker Company, Alton, Ill. The stokers are operated from a shaft located directly underneath the boiler-room floor, which is operated by a six and one-half-horsepower Westinghouse motor, with an engine auxiliary.

There is a sheet-iron smoke breeching running the entire length of the boiler room, above the boilers, which extends through the east side of the building to the smoke stack. This stack is a hand-




PLAN OF POWER PLANT, COOK COUNTY INFIRMARY, OAK FOREST, ILL.

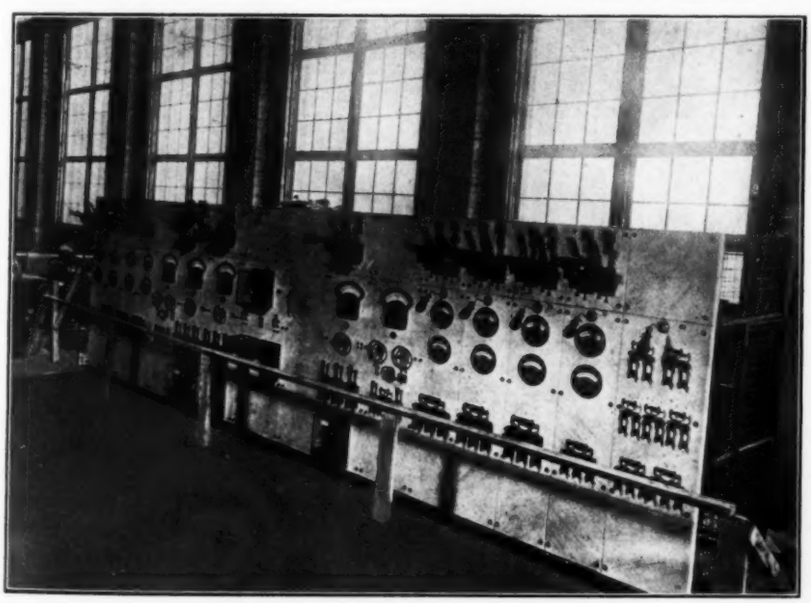
some structure, 213 feet in height and will eventually become a landmark of this institution. From the foundation to a short distance above the ground its construction is of square concrete blocks, and from this point to the top it is octagonal and higher up cylindrical in shape. The stack is paneled off at the top with gray brick, and is lined inside with No. 2 fire brick.



GENERATORS IN COOK COUNTY INFIRMARY.

Located at about the center of the boiler room are two 10 by 7 by 12 inch vertical, duplex boiler-feed pumps. These pumps, which are the only ones located in the boiler room, are provided with pressure regulators and stop automatically. The exhaust from these pumps passes through the hot-water heater.

The engine room, which is partitioned off from the boiler room by a brick wall, is 49 feet wide, by 134 feet long, and is exceptionally well lighted and ventilated. The absence of any visible piping and wiring makes its appearance decidedly attractive and pleasing to the eye.



VIEW OF POWER SWITCHBOARD.

There are three Monarch Corliss engines supplied by the H. N. Strait Manufacturing Company, direct-connected to three Western Electric engine-type direct-current generators rated at 150, 250 and 350 kilowatts respectively. As may be seen from the accompanying plan the smaller of the three generators is located adjacent to the east wall of the engine room, and the 250 and 350-kilowatt generators are located in the order named. The generators are wound for 225 volts and are connected on the three-wire system.

The main steam piping is of lap-welded steel, and wherever possible expansion bends of large radius are employed. Steam from the boilers is received into a sixteen-inch main steam header, and is led to the partition wall between the boiler and engine room where it enters the engines and is then piped to the basement under the generators. This main header is divided into three sections with auxiliary connections to the engine room header, so that the boilers may be cut into three units if necessary for the purpose of making repairs on the engine room header.

To the main steam header there are also connected three lines which discharge into a twelve-inch auxiliary header for heating the various buildings. Steam from the twelve-inch header is by-passed into the twenty-inch main heating line from which connections are made to the various tunnels. Steam is also taken from this twelve-inch auxiliary header to supply all of the pumps.

A fourteen-inch exhaust steam header in the basement collects exhaust steam from all of the engines and pumps, and connections are made to this exhaust for heating some of the nearby buildings. Provision is also made for by-passing live steam into the heating mains if there is not sufficient exhaust steam to heat the buildings. There is also an exhaust header connected directly to the feed wated heater and by-passed at the header so that it may exhaust to the atmosphere through a relief valve.

There are two boiler-feed headers provided, five inches in diameter, one being used for the hot water supply of the boilers, and the other for auxiliary feed to the boilers and boiler-washout line. All of the steam and boiler feed lines and fittings are extra heavy.

The general water supply is furnished by two six by thirty-six-inch deep-well pumps, one located in the north-west and one in the south-east corners of the engine room, which discharge into a concrete reservoir located in the basement. Suctions are run to this reser-

voir from two general service pumps, which discharge into a stand pipe in the west end of the power house. From this stand pipe water is discharged about the ground. These two service pumps are twelve by eighteen by twelve and sixteen by ten by twelve in size and are located in a line with and adjacent to the generators.

On the north side of the building there is situated a concrete rain-water cistern in which rain water from all of the buildings is collected. Two rain-water pumps in the basement distribute this water to the refrigerating machines, bath houses and the laundry building.

Near the west wall of the engine room are two hot-water pumps 7 by 4.5 by 10, directly connected to two vertical-closed hot-water heaters. In the basement directly underneath these hot water pumps are two vacuum pumps which deliver the water of condensation to the feed water heaters.

All pumps with the exception of the deep well pumps are supplied by the Platt Iron Works, Dayton, Ohio, and all are equipped to be driven by either motors or engines.

The switchboard in this institution is a model of its kind. It is of the self supporting angle-iron frame type, manufactured by the Western Electric Company, and it is located along the north wall of the power house; north of the line of generators. The board consists of sixteen panels of white Italian marble, about two inches thick, divided as follows: Three machine panels, two compensator panels, one totalizing panel and the other panels are arranged for controlling the light and power circuits.

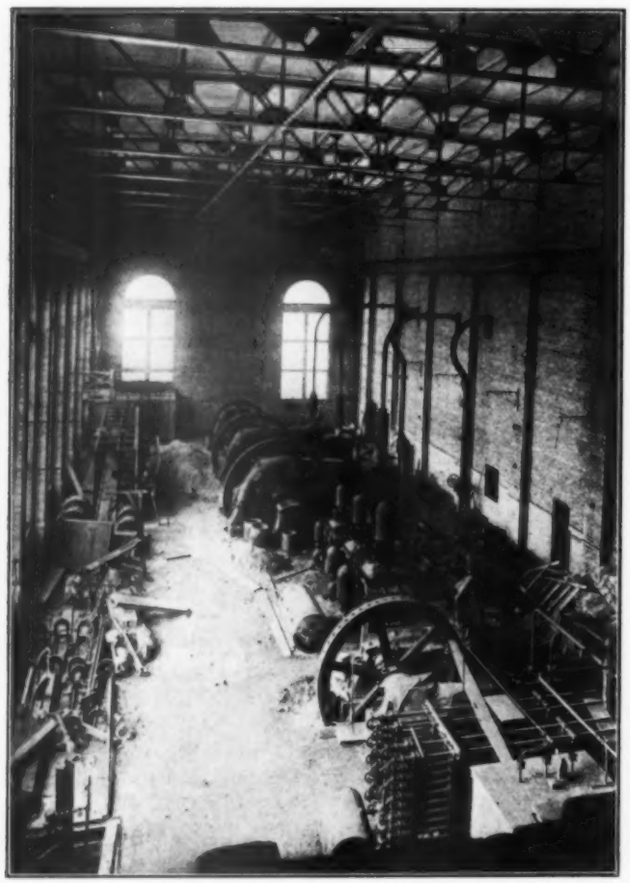
The switchboard equipment consists of the latest types of controlling and measuring apparatus, including Weston ammeters and voltmeters, I. T. E. circuit-breakers, graphic recording voltmeters and Thompson integrating wattmeters.

In line with the switchboard and directly west of it there are installed two Western Electric balancing sets for the 110-volt three-wire lighting system. One of these sets is of the capacity of 250 amperes unbalanced in neutral, and the other set is of the capacity of 350 amperes unbalanced in neutral.

A feature of the engine room is the refrigerating system installed for cooling water; air for the various service pantries and also for manufacturing ice in the summer. The ice machine is of forty tons capacity and was furnished by the Kroeschell Brothers Ice Machine Company. This machine, driven by a Murray heavy-duty Corliss engine, is in a line with and west of the generators.

An elaborate system of tunnels connects the power plant with each building and all current for lighting and power purposes, as well as piping for steam, hot and cold water and ice water is distributed through these tunnels.

In one of the accompanying illustrations there is shown a view of the electric feeders entering the main tunnel. The buildings are all served by lead covered cables suspended from the top of the tunnel by special hangers. At each building the cables are tapped and



GENERAL VIEW OF ENGINE ROOM.

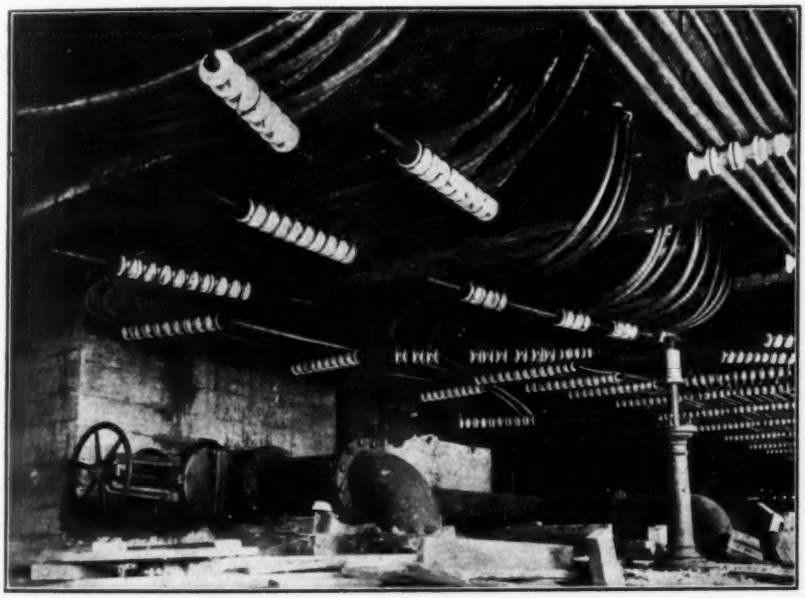
VIEW OF BOILERS, SHOWING COAL CHUTES.

enter a service box and each building circuit is controlled independently by a special service switch in the tunnel.

Where submains are connected to the main feeders a special type of service box is used. In all of the buildings the feeders are run in conduits concealed in the walls.

For the interior illumination of the buildings all types of incandescent lamps will be used, and the fixtures are all tasteful in appearance and scientific as to design. In all liklihood tungsten lamps will be extensively used for illuminating the majority of the buildings.

As was mentioned in the early part of this article the grounds surrounding the buildings are provided with an extensive system of walks and drives.



VIEW OF CABLES ENTERING TUNNEL IN BASEMENT.

These will be illuminated by arc lamps suspended from ornamental concrete posts. About sixty lamps will be used. Connections will be made underground with the tunnel lines, so that the appearance of the installation will not be affected by overhead wiring. The power plant will be illuminated by thirty-six arc lamps suspended from the wall by brackets placed about seventeen feet above the floor.

The installation of motors in the various buildings will aggregate approximately 950 horsepower. In all of the large rooms and in the kitchen motor-driven exhaust fans are provided for ventilating purposes. In the work shops motor-driven machines will be employed exclusively. The kitchen also embodies all modern conveniences and contains such appliances as electrically operated meat choppers, coffee-grinders, dough-mixers, polishing machines, etc.

The laundry building will be equipped to handle all classes of work and all the machines employed will be driven by electric motors ranging in size from one-quarter horsepower to fifty horsepower.

In view of the fact that nearly all of the buildings are only two stories in height the elevator installation is limited to a portion of the general hospital and the administration building. In these two instances, however, the installation is of the most approved type, the elevators being electrically operated.

Connections between the various buildings, departments and wards will be established by a complete system of telephones installed by the Stromberg-Carlson Telephone Manufacturing Company. The total number of instruments in use will exceed sixty. For connection with the outside world a long distance Bell line connection will be made with Chicago.

A feature of the electrical installation is the fire alarm system installed in this institution. This system, which is known as the Gamewell fire alarm System provides alarm bells located in the engineer's office in the power plant and at the telephone operator's switchboard. This system coupled with the telephone will provide adequate protection in case of fire.

The architects are Holabird & Roche, and the general contractors are the Allay Construction Company. The writer is indebted to McConnell, superintendent, for the architects and K. P. Beardslee, superintendent of construction of the power plant for the general contractors.

**Examination for Assistant Physicist.**

The United States Civil Service Commission announces that an examination will be held on April 20, 1910, to secure eligibles for positions of laboratory assistant (in physics) and assistant physicist in the Bureau of Standards, Department of Commerce and Labor, at salaries varying from $900 to $1,200 per annum for laboratory assistant and from $1,400 to $1,800 per annum for assistant physicist.

The duties in connection with these positions are similar to those of assistants in the physical laboratories of scientific and technical institutions. As far as practicable, appointees are assigned to work in the subjects for which they are best fitted. The examination will consist of the subjects of general physics, electricity and education and experience.

**Must Use Wheel Guards and Fenders.**

The Public Service Commission has filed an order on the Coney Island & Brooklyn Railroad Company directing it by October 15 to equip all closed passenger cars with wheel guards, and by July 1 to equip all open passenger cars with wheel guards or platform trip fenders to be approved by the commission. Commissioner Maltbie said that the matter of fenders and wheel guards is one of the most important considered by the commission and that at the time the commission took office, companies operating surface cars in New York city were incurring expenditures for injuries, damages and legal expenses amounting to $3,500,000 a year.

**New York Central Electrification.**

Electric service on the Harlem division of the New York Central Railrail between Forty-second Street and White Plains will be begun on March 15. The Weschester County Board of Commerce has arranged a trip over the line in a special train on March 14. The new service will reduce the running time between Forty-second Street and White Plains to about thirty minutes.

### Meeting of Central Electric Railway Association at South Bend, Ind.

The prevention of accidents, the best plan of soliciting business and the more permanent city construction for interurban lines were the predominate topics discussed by the members of the Central Electric Railway Association in bi-monthly meeting held in the Oliver Hotel, South Bend, Ind., March 24. The executive committee held a meeting the previous evening and disposed of all the regular business and admitted nine new members, making a total of about five hundred.

The meeting was called to order by the president, George Whysall, general manager of the Columbus, Marion and Bucyrus Railway, who congratulated the association on the excellent attendance and the favorable conditions and surroundings under which the meeting was being held. President Whysall said that he deemed it advisable to call the members' attention to some matters which he hoped would create a discussion and exchange of ideas calculated to lead to better service to traction patrons, and consequently improved conditions from an operating viewpoint. He said further, that as president of the association, he had observed a feeling on the part of some of the companies that indicates a lack of confidence in each other. This, he thought, prevents the necessary co-operation in an undertaking of this character. He commended the work of the traffic association and pointed out the vast amount of work accomplished in systematizing the rates on the forty-seven systems connected with the association. He said he could not urge too strongly the necessity of cultivating courtesy on the part of officials and employes who deal directly with the patrons of the traction lines. The president suggested that the association publish an official interurban map to show impartially all the companies members of the association in heavy red lines.

Mr. Whysall said that inasmuch as the work of the association is largely educational, he would insist that all papers and subjects presented be referred to a committee and more generally discussed than in the past. He advocated a two-day convention in order that this idea might be carried out. He concluded by saying that the problems now confronting the interurban roads are to increase their efficiency by adding to the standard of their equipment and the courtesy of their employes.

The first paper of the morning session was presented by C. O. Warfel, general traffic agent of the Indianapolis and Cincinnati Traction Company, Indianapolis. He described in an interesting manner the various plans for soliciting business for interurban roads and presented a number of ideas and suggestions of value growing out of his experience, suggestive of the subject of his paper, viz., "Soliciting Business." Mr. Warfel's paper provoked a hearty discussion by the traffic men present, which consisted largely in relating experiences and the results of persistent effort and a variety of methods.

Thee afternoon session was opened with the reading of a paper on "Prevention of Accidents," by E. F. Schneider, general manager of the Cleveland & Columbus Railway Company, Cleveland, O. Mr. Schneider pointed out that it costs the people of the United States $125,000,000 a year for preventable accidents. He discussed the responsibility of electric roads relative to preventable accidents from a moral, legal and economical view and presented practical plans for prevention of accidents and suggested the more general employment of modern inventions and improvements that materially lessen the risk of accident.

Following the reading of the paper, the subject was discussed at length and a number of inquiries satisfactorily answered by Mr. Schneider showed that he was familiar with his subject.

H. L. Weber, the chief engineer of the Columbus, Marion and Bucyrus Railway, read the concluding paper on the subject of "Permanent City Construction for Interurbans." He described in detail the best method of concrete construction of city tracks for heavy interurban service and insisted on the necessity of getting away from the idea of temporary construction in building, improving or repairing electric railways and surface equipment. As a matter of economy as well as safety the more permanent the construction the greater the lasting qualities, hence, such work should be made as permanent as any steam line.

The engineers present discussed Mr. Weber's paper very thoroughly and brought out a number of new ideas relative to the best materials to be used in constructing city tracks.

### Chicago Electric Club.

"Illumination and the Eye" was the subject of an interesting and instructive address delivered before the Chicago Electric Club on Wednesday, March 23, by Dr. Henry Gradle, a well-known oculist of Chicago.

Doctor Gradle described the construction of the eye as consisting of essentially three parts: the iris, the focusing lens, and the retina. The iris is a diaphragm which contracts to regulate, to a certain extent, the amount of light, which, passing through the focusing lens, falls upon the retina at the back of the eye-ball, exciting the optic nerves which lead to the base of the brain. The retina is the sensitive part of the eye.

The speaker explained that the optic nerves which "correct" images in the eye, really falsify objects. He said that it is a singular fact that the human eye is not as accurate as a well-made optical instrument. Every eye has some defects, but these do not necessarily interfere with its use. As images in the eye are converted into sensations felt by the brain, they are subject to falsification. The distribution of colors and shades, as it seems to us, is not necessarily the same as in nature, but since the sensations are corrected in the same way every time, we get a correct understanding of the objects surrounding us.

The eye has a wonderful power of adapting itself to different degrees of illumination. Doctor Gradle explained that by entering a dark space no details of the surroundings are observed, but soon the eye adjusts itself and objects begin to loom up. A peculiar psychological phenomenon occurs through fatigue of the eye, after looking at a brightly illuminated object.

In connection with the subject of the eye's adaptability, the speaker referred to a striking instance where a picture of a snow scene by moonlight and a snow scene in sunlight are hung side by side, and while they may be colored in about the same way, the eye will recognize each to be a correct representation of what it is intended to be, although reflected sunlight is many thousands of times stronger than reflected moonlight. The explanation given was that the eye is so adaptable that it is less sensitive when it is in the sun and more sensitive when it is in a fainter light, so that the image carried to the brain is about the same under both conditions.

## THE MINNEAPOLIS ELECTRIC SHOW.

SUCCESSFUL EXHIBITION PROMISES TO BE AN ANNUAL EVENT HEREAFTER.

The first annual Electric Show of Minneapolis, conducted under the auspices of the Northwestern Electric Show Association, was held in Minneapolis, Minn., March 26 to April 2, and the results reported by the management indicate that the affair will be an annual one hereafter.

The show was held in the Armory of the Minnesota National Guard and no expense was spared in creating a magnificent decorative and lighting effect. The booths were laid out on a plan similar to that followed in the recent Chicago show. Four posts marked the boundaries of each exhibit space and on top of each was installed an art glass dome enclosing a tungsten lamp of high candlepower. Over each booth was hung an ornamental art glass dome, in which was installed five 100-watt tungsten lamps, equipped with Holophane reflectors. The arches over each booth were decorated with miniature incandescent lamps partially hidden by leaves and flowers. The walls and ceiling were covered with colored bunting bedecked with tinsel and varicolored glass globes, upon which the rays of several searchlights played.

An historical touch was given to the occasion by the exhibit of the electrical engineering department of the University of Minnesota. There was displayed in this booth a number of early electric measuring instruments, a series-parallel street-car controller, manufactured by former students, several types of old-fashioned motors and generators, telephone and telegraph instruments, and displays showing the development of the incandescent lamp and of various electrical fittings.

Band concerts given daily by Rossiter's Band, added to the interest of the show, as did the solos of Miss Blanche B. Mehaffey.

The Minneapolis General Electric Company, which was the largest exhibitor, occupied the north end of the hall. A feature of this exhibit was an elegantly appointed four-room apartment equipped with every known electrical appliance used in a modern household.

The following is a fairly complete list of the exhibits of the various manufacturing companies and other concerns represented at the show:

The American Bank Protection Company, Minneapolis, Minn., made an attractive display of its electrical burglar alarms, sectional steel fixtures, bank safes, vault doors and chimes. A section of its booth was fitted up as a bank vault and equipped with various electric alarm systems. The company was represented by G. W. Fletcher.

The American School of Correspondence, Chicago, Ill., maintained a booth in a prominent location, from which there was distributed literature pertaining to its various engineering courses. W. S. Lockwood was in attendance.

Vernon Bell & Company had on exhibition a number of Hawthorn motors, a line of Paiste fittings, Westinghouse fans, and intercommunicating telephone sets, and instruments. C. B. Bell represented the company.

The Berger Manufacturing Company, Minneapolis, Minn., had on exhibition two stationary electric vacuum cleaners which were shown working under severe conditions by the demonstrators.

The Bishop & Babcock Company, Cleveland, Ohio, showed in operation electric water lifts, for pumping soft water or for increasing city water pressure; electric carbonators for soda fountain use and electric air compressors, for inflating purposes. The company was represented by W. H. Day.

The Bryan-Marsh Company, Chicago, Ill., had on exhibition a complete line of Mazda and other incandescent lamps of all sizes. There was also shown a cabinet containing the incandescent lamp in the various stages of its manufacture. An interesting feature of this exhibit was a number of specimens of tungsten metal in its crude form. J. L. Barnard, S. Furst, W. H. Raker, F. Chamberlain and W. H. Gage were in attendance.

Cadwell & Brown Company, Minneapolis, Minn., exhibited motors, instruments and transformers manufactured by the Wagner Electric Company; Palm stationary electric vacuum cleaners; Shepard electric hoists and sanitary pumps. Those in attendance were Geo. Cadwell, E. H. Brown, and J. A. Devereux.

The Central Electric Company, Chicago, Ill., exhibited Opalux shades, Columbia Mazda incandescent lamps, a line of "P M" motor-connecting blocks, high-tension disconnecting wall switches, Pelouze universal electric flatirons, high-tension span dropouts, Pittsburgh lighting and bell-ringing transformers, Central Electric time-switches, Galvaduct and Lovicated iron conduit and a complete line of Okonite products, including wires and cables, tape and other of its products. The company was represented by D. C. Penniman, B. J. Kacin and J. M. Lorenze.

The Columbus Buggy Company, Columbus, Ohio, had on exhibition one of its new model four-passenger electric limousines. The company was represented by H. H. Martin.

The Crane Company, Chicago, Ill., exhibited electrically operated straightway and emergency valves, Cranetilt steam traps for returning water to boilers under pressure and a complete line of brass and iron valves and standard pipe fittings. G. A. Chaffee, manager of the Minnesota Branch, was in charge, assisted by W. A. Morgan, H. Sabin and W. C. Camp.

The Duntley Manufacturing Company, Chicago, Ill., showed a full line of its pneumatic electric vacuum cleaners, Duntley humidifiers, air-purifiers and also a complete line of household appliances, comprising electric flatirons, toasters, etc. J. D. Fletcher, of the Minneapolis office, was in attendance.

The Electrical Engineering Company, Minneapolis, Minn., exhibited ozonizers, American Electric heating devices, Robbins & Myers fans, New York Insulated Wire Company's products, wires and cables by the John A. Roebling's Sons Company, Duncan alternating and direct-current wattmeters, Chicago Fuse Wire and Manufacturing Company's products, Klein's tools, Eck fan motors, National Carbon Company's products and a complete line of electrical specialties. W. E. Stephenson was in attendance.

The Electric Carriage and Battery Company, Minneapolis, Minn., exhibited a four-passenger Rauch & Lang electric victoria phaeton.

Electric Cleaner Company, Chicago, Ill., had on exhibition its "Positive" and "Reliable" portable electric vacuum cleaners, together with a line of fittings used in connection with these cleaners. The company was represented by D. D. Crowley.

The Electric Shop, Minneapolis, Minn., showed a complete line of practical household utensils, including electric toaster-stoves, sadirons, teapots, water heaters, coffee percolators, and radiators. W. Woehler and E. D. Rollins were in attendance.

The Empire Vacuum Company, New York, N. Y., exhibited a number of its portable electric vacuum cleaners in operation, working under severe tests. The company was represented by R. B. Nevius.

Fairbanks, Morse & Company, Chicago, Ill., maintained a booth in a prominent location in which was shown its standard line of alternating and direct-current motors for both constant and variable speed. Several machines were disassembled for inspection. A feature of the exhibit was a complete suburban residence lighting plant comprising a special Fairbanks gasoline engine driving a generator, also storage batteries and a complete switchboard. This plant has a capacity of fifty fifteen-watt tungsten lamps. This company also exhibited a complete line of Monarch Mazda lamps. The company was represented by A. E. Garland.

W. W. Geisse, Minneapolis, Minn., had on exhibition Roller-Smith circuit-breakers and other instruments, Columbia Mazda and other incandescent lamps, Philadelphia Storage Battery Company's storage batteries and the Stackpole Battery Company's dry batteries.

The General Electric Company, Schenectady, N. Y., exhibited a complete line of motors, flaming arc lamps, intensified, magnetite and luminous arc lamps, Mazda and tantalum incandescent lamps, heating and cooking utensils, fuses, switches, and transformers. The arc-lamp exhibit included types suitable for offices, stores, streets and factories. The exterior of the Armory was illuminated by two eighteen-ampere flaming arc lamps supplied by the General Electric Company. The incandescent lamp exhibit included various sizes and types of lamps for every possible purpose. The heating exhibit comprised electric cooking and heating utensils for the household, including chafing dishes, percolators, water cups, toasters, milk warmers, and various other devices. The motor exhibit included motors of all sizes up to five horsepower. There was also shown a line of buffing and grinding motors, drills and sewing-machine motors. Among the representatives present were R. A. Swain, W. F. Smith, F. H. Gale, C. J. Strayer, J. E. Neuman, G. G. Fletcher, and E. R. Gillett. The exhibit was installed by L. W. Shugg, of Schenectady.

The Hackney Sanitary Electric Ventilating Company, St. Paul, Minn., had on exhibition the Hackney electric ventilator, which was invented by L. S. Hackney, and which supplies fresh air and exhausts foul air from a room. A feature of the exhibit was an installation showing how this ventilator is used in practice. J. B. Murphy was in attendance.

The W. O. Hartig Electric Company, Minneapolis, Minn., occupied a prominent exhibit space and distributed literature relating to its fan motors, sadirons, sewing-machine motors, power motors and other apparatus. The company was represented by W. O. Hartig.

The Hollis Electric Company, Minneapolis, Minn., exhibited Century single-phase motors, Crocker-Wheeler direct-current motors, including its line of type "L" motors from the smallest to the largest size. There was also exhibited a Crocker-Wheeler single-phase motor in operation using a generator as a load. There were also shown a complete line of electric automobile head-lights, battery charging rheostats, rectifiers and magnetos. T. W. Findley was in charge of the exhibit.

The Hurley Machine Company, Chicago, Ill., had on exhibition its Thor electric washing machines. These machines were shown in actual operation by demonstrators. One of the machines was equipped with the universal shaft, which permits of other operations of the motor while the washing machine is in operation. The company was represented by W. A. Murfey.

R. M. Laird, Minneapolis, Minn., had on exhibition a complete line of Federal Electric products comprising Federal window lights, tungsten clusters, shaving mirrors, clamp sockets, fixtures and various other fittings. In addition there was also shown Everson electric vacuum cleaners, Del curling irons, Wing turbine blowers, Ilg ventilating fans, Coles coffee-grinders and a number of art-glass domes and portable lamps.

The Loberg Gas and Electric Fixture Company, Minneapolis, Minn., had an attractive booth in which was shown a complete line of artistic electroliers, art-glass domes and ornamental portable electric lamps.

The Minneapolis Electric Motor Company, Minneapolis, Minn., had on exhibition a comprehensive line of small motors, electric searchlights, electricians' and wiremen's tools and fittings and other electrical specialties. A portion of this booth was fitted up as a wireless telegraph station and messages were exchanged with similar stations across the hall.

The Minneapolis Gas Fixture Company, Minneapolis, Minn., had installed in a handsomely appointed booth a number of its newest types of electroliers, portable lamps and wall brackets.

Minnesota Electric Company, Minneapolis, Minn., had on exhibition a large assortment of interior telephones and telephone apparatus, a line of "Standard" fans, Chapman lightning arresters, and an electric time system comprising master and secondary clocks and time stamps. The company was represented by W. J. Chapman.

The National Electric Lamp Association, Cleveland, Ohio, maintained a booth located in a prominent position near the main entrance. Along one side of the exhibit space there was suspended a bracket to which was attached a number of incandescent lamps of various types and candlepowers, ranging in size from a two candlepower to a 100-watt Mazda lamp. Over one hundred lamps were shown in this exhibit. The lamps were displayed in two large cases; one case was lighted by numerous frosted globe Mazda sign lamps and also contained a complete line of Mazda 110 and 220-volt, pear-shaped and round-globed Mazda, multiple lamps. A second case contained Mazda multiple lamps equipped with Holophane glass and steel reflectors. In the center of this case there was placed a sixteen-inch Holophane hemisphere, in which was mounted lamps of different colors. There was also shown the regular line of Mazda and tantalum lamps burning at various angles. A source of much interest in this exhibit was the Mazda 250-watt street series lamp which was kept constantly burning. The exhibit was in charge of C. O. Brandel, A. J. Hitzker, S. E. Doane and W. M. Skiff.

The New England Furniture and Carpet Company, Minneapolis, Minn., occupied a large space in which there were shown a large number of highly artistic portable lamps, wall brackets, electroliers, and art-glass domes. In another space this company showed a number of electrically operated graphophones, one of which was used in connection with the band.

The Northern Display Advertising Company had on exhibition a number of electrical advertising devices, a feature of which was a piano, the outlines of which were studded with incandescent lamps.

The Northwestern Electric Equipment Company, Minneapolis, Minn., showed a complete line of Holophane glassware and steel reflectors. In addition there were exhibited Fostoria incandescent lamps, "Hot Point" electric flatirons, and a general line of electrical supplies. The company was represented by Bob Payne, H. G. Wyatt and M. P. Ellis; E. B. Gray represented the Holophane Company.

The W. S. Nott Company, Minneapolis, Minn., exhibited a scientific stretching apparatus as applied to the manufacture of leather belting. This company also showed a complete line of rubber goods, including electricians' gloves, rubber mattings for power plants, Garnet belt dressing, packing, and belts. Atlas fire extinguishers were also shown and several of these were given practical demonstrations in a fire which was caused by a balloon explosion. A. J. Brechtel and C. J. Brudigan were in attendance.

Olson & Becker Company, Minneapolis, Minn., exhibited the "1900" washing and wringing machines, several of these being shown in operation.

The Pierson-Wilcox Electric Company, Minneapolis, Minn., exhibited a line of Sprague motors, telephone apparatus, Willard storage batteries, and other electrical supplies.

The Pike Electric Manufacturing Company, Minneapolis, Minn., had on exhibition steel cabinets, panels and switches. A feature of the exhibit was the new style house panel particularly adapted for residence use. Another feature was an electrically operated punch press, which was used to punch out various parts of switches. The company was represented by S. A. Libbey.

The Safety Insulated Wire & Cable Company, New York, N. Y., exhibited methods of making joints; also deep-sea submarine cables, both paper and lead-insulated, and a number of samples of rubber-insulated high-duty wires and cables.

The Santos Sales Company, Minneapolis, Minn., Northwestern representatives for the Keller Manufacturing Company, Philadelphia, Pa., displayed a line of Santo portable electric vacuum cleaners and also its stationery types. A special feature of this exhibit was the mechanism of a Santo cleaner inclosed in a glass case, showing its operation. The auxiliary apparatus used in connection with vacuum cleaners was also shown. Chas. F. Fries and E. J. Patterson were the representatives in attendance.

Studebaker Bros. Company, of Minnesota, had on exhibition a four-passenger electric stanhope and a four-passenger electric victoria phaeton.

Students of the West High School maintained a booth equipped as a wireless telegraph station with both receiving and transmitting apparatus.

The Universal Sales Company, Minneapolis, Minn., exhibited Richmond suction sweepers and Arnold vibrators. Both the vibrators and cleaners were shown in operation and the various fittings supplied with each were demonstrated. F. E. Rudolph and R. R. Murphy were in attendance.

The Western Electric Company, Chicago and New York, occupied a double booth and had on display a complete line of telephone apparatus, generators, motors and supplies. Visitors showed a great interest in the old switchboard and old receiver on exhibition in this booth. The former is the second switchboard ever placed in successful operation, the first having been installed only three days previous in 1877. The old receiver is the 863d ever manufactured and was turned out of the shops in Chicago just two years after Alexander Graham Bell startled the world with his new invention. Beside the old board for comparison was one of the latest type of self-restoring switchboards which illustrates the wonderful development reached by the Western Electric Company in the manufacture of telephone apparatus. Another big attraction in this booth was the telautograph in operation. This was the first time that Minneapolis people have had an opportunity to examine this apparatus close at hand and its operation was watched by large crowds. The other special features of the booth were the tungstolier line of fixtures, an Adams Farnham gas engine direct-connected to a Hawthorne generator, and the large electric sign in the shape of the trademark of the Western Electric Company illuminated by 470 colored incandescent lamps, with the location of the branch houses of the company indicated by red lamps.

The Westinghouse Electric and Manufacturing Company and the Westinghouse Lamp Company exhibited jointly. The former had a very complete display of all types of motors up to and including its fifteen and twenty-horsepower size for both alternating and direct current and for all classes of service. The company also showed a complete line of the controlling apparatus for the control of the different motors which were exhibited. One alternating-current small motor in its small motor exhibit was connected to 110-volt sixty-cycle circuit which was belted to a motor operating as a generator, this motor being connected to a direct-current motor, which was in turn belted to another small direct-current motor which was operated as a generator and which had for a load a twenty-watt tungsten lamp. Among its detail apparatus was shown various types of fan motors, switchboard indicating and integrating meters, as well as eighteen or twenty different types of portable meters, including several precision instruments. The exhibit of heating apparatus consisted of tailors' irons, gluepots, chocolate warmer and samples of its complete line of family sadirons and cooking apparatus. The company exhibited for the first time its bell-ringing transformers and showed both sizes, those built with the secondary windings to give ten volts and the larger sizes which are built to give from the secondary winding either ten or twenty volts. The Westinghouse Lamp Company had a very complete exhibit of both tungsten and carbon lamps for all classes of service (including street series-lighting, railway work, sign work), and for special display installations. This company had in operation several sizes of its well-known low voltage tungsten lamps connected to an economy coil. There were also shown lighted a complete line of standard tungsten lamps for 110 and 220 volts, ranging in size from 250-watt to 40-watt lamps. Among those in attendance at the exhibit were the following from the Minneapolis office: W. D. McDonald, H. C. Auran, C. C. Curry, H. R. McAlmon, F. J. Brittingham, H. R. Heim, Geo. F. Darling, F. W. Parkinson and Frank Law. W. Barnes, Jr., representing the Westinghouse Bureau of Publicity, of Pittsburg, Pa., was in charge of the exhibit.

The Zimmer Vacuum Renovator Company, Minneapolis, Minn., showed a line of five different types of portable and stationary vacuum cleaners. These included both the Morey and Russell types.

# CENTRAL-STATION PRACTICE

## Transmission—Interior Wiring.

### THE DISEASES OF BOILERS.[1]

BY F. S. ALLEN.

Boilers are heirs to nearly as many diseases as the human family. Some are crippled from birth, owing to errors in construction. The most marked and important of these congenital troubles is the one that makes itself known by the failure of the lap seam along a line which passes close to the rivet holes, but usually does not enter them, except when radiating branch cracks are present.

There were few failures from the lap-joint crack when iron plate was exclusively used in the construction of boilers, and this was doubtless due to two main facts,—first, the fact that the plates then used were small, and second, the fact that steel (which is now used almost universally for boiler shells) is much more likely than iron to develop this particular defect.

Certainly the workmanship was no better in the days of iron than it is now, and in fact it was, as a rule, probably distinctly inferior; and while the pressures that were carried were less than they are today, the boilers were no better adapted, by reason of design and construction, to bear those lower pressures, than modern boilers are to bear the higher ones that we find to-day.

A more important circumstance was, that in the use of iron it was impossible to obtain large plates. Thus boilers four feet or more in diameter were made with two plates to a course, and a boiler sixteen feet long was usually built in five courses, and never in less than four. The girth seams doubtless stiffened the plates, for in the examination of a great number of boilers that had exploded by rupture of the seams it was found that the fractures commenced midway between the girth joints. In hundreds of cases, too, the main line of fracture has developed lateral branch cracks, which have been detected by the inspector because they showed just beyond the edge of the inner lap; and then, by cutting out rivets and opening the joint longitudinal fractures have been discovered, without actual explosion of the boiler. Cracks discovered in this manner are always in the center of the course. Furthermore, in destructive tests of boilers we have found the distress to begin, and failure to occur, at the middle of the course. All of these facts show the importance of the stiffening action of the girth joints upon the shell.

Passing now to the consideration of the effect of the material itself, we note, first, that iron withstood the severe treatment of whipping down the ends of the plates with sledges—this practice having once been nearly universal in boiler shops. The only remedy for this is to provide a massive former, which, by heavy pressure, finishes the ends of the plates and brings the laps to as nearly a circular form as possible, though even with this precaution there is always some flattening at the lap.

Steel appears to resent the sledge-hammer treatment, and it is also sensitive to the slight local movements that occur near the joint, owing to variations of pressure in the boiler, and to the fact that the contour of the boiler shell is not truly circular near the joint.

Another defect that can be produced in riveted joints is due to neglect in adapting the pressure that is employed for closing the rivets, in hydraulic riveting (which is the best method of riveting), to the nature of the joint that is being made. The pressure that is maintained upon the accumulator should be varied according to the diameter of the rivet that is to be driven, and the thickness of the plate of which the shell is to be made.

Ruptures of plates from these causes occur with little reference to factors of safety, or to the age of the boiler. They sometimes develop within a year or two, while in other cases they do not appear until after several years of service.

Alteration of the structure of the boiler, under the influence of stress and temperature, is undoubtedly the cause of failure in many cases, and evidence of the fatigue of metal, which admittedly occurs in all classes of machinery, is found in boiler plates. Fractures in the plates, away from the seams, have been found occasionally, and surface cracks, either internal or external, may develop in the shell, the plates being then brittle enough to be readily broken up with a hammer when they have been removed from the boiler. Such cracks are not so frequent, in the central or free parts of the plate, as they are near a flange or some other rigid connection, where the effect of the movement of the plate may be localized. The localization of strains in this way has been the cause of frequent failure or fracture in some types of boilers, with the result that expensive repairs have been required, and in many cases explosions have resulted.

We also find evidence of profound alteration of the structure of the material in boiler tubes, these often losing their ductility after a few years of service, even though they may have been reasonably ductile when new. Undoubtedly the skelp from which these tubes were made was of an inferior quality; and the alteration in their structure, with the resulting liability of fracture, is probably due to the temperature to which they are exposed, rather than to the pressure.

Of late there are many defective bolts found, among those that are used for holding the tube caps on the manifolds in some types of water-tube boilers. This is a dangerous defect, as most of these boilers are operated under high pressure, and the caps are upon the outside, so that the failure of the bolt releases the whole contents of the boiler into the fire room. This matter is so serious that it has been taken up by one of the large electric-road operators, and chemical tests have been made of

1 From an address before the New England Association of Electric Lighting Engineers. Mr. Allen is Chief Inspector of the Hartford Steam Boiler Inspection and Insurance Company, Hartford, Conn. Acknowledgement is due to *The Locomotive* (Hartford, Conn.), for this condensed reprint.

the various bolts in actual use, and of the bolts purchased. The number of defective bolts found during the past year was very great, while ten years ago it was the exception to find any such bolt defective. I cannot say what the result of the investigations now going on in my department, and among steam users, will develop, but from personal investigation I believe that the bolts that have been used for the past few years are of steel, and evidently they are commercially-made bolts. The ductility of many of the defective bolts is so far reduced that, though they are an inch in diameter, a blow from the light hammer used by the inspector would snap them off with a single blow. Many were also found to be cracked partially through.

With regard to these bolts I would say that the remedy, in my opinion, would be to use bolts that are forged from the very best quality of Swedish iron. These bolts are not subject to alternating or intermittent variations of stress, and hence it appears probable that the change in molecular structure that they undergo is to be ascribed to the natures of the material from which they are made, the alternation taking place as a result of the temperature to which they are exposed.

One other cause of rapid deterioration and loss of efficiency in boilers is the formation of incrustation and scale. Water-tube boilers are peculiarly sensitive to this, as their tubes are liable to become overheated, and the thin material of which they are made then becomes subject to distortion, where the relatively heavy plates of a boiler shell would remain comparatively unaffected. A great many cases of this kind occur yearly, and the rupture of the tubes is not infrequent.

Some twelve years ago several tubes ruptured in one of our best equipped and largest electric plants, and overheating of the lower tubes was noted in all the boilers. Many were quite badly affected, and others not so seriously. Some of the least affected tubes were selected, and many specimens taken from there were sent to Watertown, Mass., for test. The results were of considerable value. The rapid deterioration of the tubes was considered to be largely due to the feed water and to the nature of the incrustation. A change was made in the water supply, and I do not recall any trouble with tubes experienced at this plant since.

The failure of tubes in water-tube boilers is not infrequent. It is sometimes due to defects in construction or in welding; but I have noted one peculiar fact, which has impressed me considerably, and that is, that except in cases in which the weld was defective, I have not noted a single case in which the failure occurred directly at the bottom of a tube. This fact may be of little interest, but it has impressed upon my mind the view that structural change in the material, leading to the failure or splitting of the tube, takes place a little towards one side of the bottom, or (say) at "about eight o'clock" in the circle of the tube.

The increase of temperature attendant upon the use of higher pressures has brought about some new developments, detrimental to boilers, in connection with the formation of scale, and this is especially true in the fire-box type of upright boilers. There is little space, in these boilers, for the deposit of scale upon the tube sheets directly over the fire, and in view of the large amount of heating surface and the normal evaporation, the formation of scale must be very rapid upon the tube sheet, especially when the feed water is at all brackish. Two marked instances are worthy of notice, the observed results seeming hardly credible. In both cases the boilers were nearly new, and were of good construction, and working under proper factors of safety. Leakage around the tubes developed quite early.

In one of the cases the trouble occurred in a battery of very large boilers of this upright type, operating at a pressure of 170 pounds per square inch; the owners in this case (as well as in the second one, presently to be noted) having a large number of boilers of the same type operating at 125 pounds. There had never been trouble from scale, although in the older boilers, operated at 125 pounds, there was a considerable deposit of mud which was readily removed by periodical washings. No trouble from leakage had been experienced from this sediment at any time, in any of the boilers of this plant, until the new high-pressure boilers were installed for electric power; and the plant was thoroughly modern and up-to-date, and everything of the best construction. An examination of the high-pressure boilers, after the leakage around the tube ends had developed, showed a thin, hard coating of sulphate of lime over the whole tube sheet, and making a slight fillet around each tube. The coating resembled an enamel lining more than a scale, owing to its extreme thinness, and its adherence to the plate. The fact that the same water had been used in boilers in operation in this plant for over twenty years, and that no trouble had occurred from scale or deposit, made it difficult to persuade the engineer that the leakage was due to the feed water, and to scale formation; but by the judicious use of solvents, the enamel-like coating was finally dissolved, and no leakage has occurred since, solvents being now used to prevent further deposition of scale.

The second case was similar to the first, but the plant was many miles away, and used an entirely different water. Nevertheless, the same kind of action took place in the boilers that were operated at 160 pounds, although boilers in the same room had been operated on the same water, with entire success, for twelve years, at 125 pounds. This second case also yielded to treatment, and the affected boilers have since been running at their maximum capacity without leakage or trouble of any kind.

By way of explanation we may assume that the difference between the temperature, due to 125 pounds pressure, and that due to 160 pounds, was sufficient to cause the precipitation, in each case, of a small quantity of sulphate of lime, which, at the lower temperature, had remained either in solution, or in suspension with the mud that had been washed out so readily.

The importance of eliminating all lubricating oils from boilers is almost too well known to be worthy of mention, yet oil continues to be a great source of injury and destruction, where the water of condensation is recovered from the exhaust steam, and used over again in the boilers. Separators are put in, having a nominal capacity based upon the area of the exhaust pipes, without reference to the volume of steam that these exhaust pipes are to carry. This is a grave error, in many cases. Separators have capacity, as well as other machinery; and in installing an oil separator, care should be taken to ensure for it a capacity sufficient to handle the full volume of steam passing through it.

There also seems to be much difficulty experienced in removing oil from boilers, when it has once effected an

entrance. This can be done readily, in some types of boilers, by swabbing the sheets and tubes with a mop dipped in kerosene oil, after taking the highly important precaution of extinguishing all open lights about the boiler, as a measure of safety. In other cases, where the boilers are inaccessible for mopping, they can be boiled out with a strong solution of soda ash (or caustic soda if the soda ash does not prove effective), with a generous addition of kerosene oil, the pressure being maintained at half or two-thirds of the regular working pressure for from twelve to twenty hours. After this treatment the oil can usually be washed out in the form of a curd.

Corrosion, another boiler disease, is not so common to-day as formerly, but it still is an active enemy of steam boilers. I say it is less common than it was formerly, because a great change has been made, in the last few years, in the types of boiler in general use, and those that are at present most common are less liable to corrosive action than were the drop-flue, hammer-head, and similar types having a poor circulation at the bottom. We still have with us some types in which there is a tendency to corrosion, and no universal remedy can be relied upon. Instead, each case must be carefully investigated, and a remedy applied that is appropriate to the cause of the difficulty. Where the water is pure and the boilers are operated intermittently, corrosion is frequently found in the form of pitting. This action takes place very often in pumping stations, and in power plants and electric stations where the fires are kept banked for long periods, with the water in the boilers quiescent, and far less often in boilers that are always in active service. Boilers that are used exclusively for heating purposes suffer more than any others from pitting.

Once started, corrosion is likely to go on until the material of the boiler is destroyed, unless measures are taken to check it. When corrosion is observed in connection with the use of a pure water, one of the best methods of treatment is to keep the water alkaline with soda ash, for this tends to check the corrosive action, and the soda does not injure the boiler.

Care should be exercised, in selecting feed water for a new plant, or for a new location of a plant, to see that the quality of the water is good. Nitrates in the water should be especially avoided, as they are especially troublesome and dangerous. The presence of nitrates commonly results in the formation of a light scale coating, under which an active destruction of the material of the boiler goes on, the plates and tubes becoming wasted away, and the braces and rivet heads cut off.

In certain types of boilers the breakage of staybolts is a frequent and annoying, as well as expensive, occurrence. Such bolts are often drilled with a three-sixteenths-inch hole, which either passes through the entire length of the bolt, or at least goes in deeper than the thickness of the outside sheet; and such holes are supposed to give absolute safety, so far as the detection of broken bolts is concerned, the theory being that steam will escape from the end of the bolt as soon as fracture has occurred, and thereby call attention to the trouble. The drilled hole is not to be relied upon, however, because, in the process by which the staybolt fails, the fracture will creep into the bolt slowly, and when it first encounters the hole, moisture from the boiler will leak out through it in very slight quantities, and evaporate without attracting any attention. In evaporating, however, the moisture leaves behind it a certain amount of solid matter, and this accumulates until it forms a hard, baked residue, completely choking the opening in the center of the bolt, so that the apparent absence of leakage leads to a sense of security which is far from corresponding to the actual facts. Many bolts that have been drilled, for the purpose of providing security against undiscovered fracture, have been found to be completely broken off, and many others have been found to be partially broken, without any noticeable leakage occurring in either case. It will be plain, therefore, that if any reliance is to be placed upon the drilled staybolt, it is important to ream out the holes frequently, and keep the openings free. The breakage of staybolts is sometimes due to circumstances connected with the environment of the boilers, to their exposure to injury from external causes, to strains from varying temperature and differential expansion, and to faulty construction or poor material in the bolt.

Many of the minor diseases of boilers, such as rapid loses of ductility, and development of incipient fractures at different parts (as at the girth joints in the plain tubular boiler), may be due to the conditions under which the boilers are operated, such as to the varying level of the water, and to the introduction of cold feed water, or to blowing down the boiler under high pressure and leaving the drafts on, so that cold air may be drawn through and so give rise to serious unequal contraction, or to pushing the fires too hard in raising steam from cold water. Several strains, resulting in leakage at the seams and around the staybolts and tube ends of fire-box boilers, are frequently caused by the burning out of the fire under one boiler of a battery, while this boiler is left connected with the rest of the battery, and with the draft full on. All these defects are developed by poor practice or management.

Just a word, in conclusion, about the action of superheated steam. When superheating is done in connection with steam generators, the elasticity and strength of the material are affected if a high temperature is produced, and I look forward with considerable anxiety to the results that may follow when boilers are operated in this way for a term of years. It has come under my own observation, that cast-iron is an unsuitable material to use, for exposure to superheated steam of high temperature. I have in mind some extra heavy valves of the best make, with cast-iron bodies, which, when exposed to superheated steam at high temperature, became badly checked and marked, so that the whole body of the casting had an appearance suggestive of the crazy cracking observed on imperfect crockery. These valves were replaced by others in which soft steel castings of the best quality were used in the place of the cast-iron, and the new ones have thus far, I believe, shown no defects. Fittings or manifolds of cast-iron, connecting superheaters with the generator, should not be indorsed or approved for superheating to 100 degrees or over. In fact, I think that cast-iron for such purposes has already been abandoned in the best practice, forged or wrought iron being substituted for it.

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At a recent meeting of a local mining society in England, Prof. J. Cadman recommended the careful spreading of stone dust on all roads containing electric cables, as a simple and efficacious way of preventing ignition of coal dust by flames from the cables.

## THE NEW YORK EDISON COMPANY AND ITS RELATION TO THE ELECTRICAL VEHICLE.

BY ARTHUR WILLIAMS.

The New York Edison Company was one of the first to appreciate the possibilities of the electric vehicle, and has been actively identified with its progress since its first introduction for commercial purposes.

Realizing that the "electric" as an economical transportation proposition was receiving the attention of progressive business men, and that the situation was deserving of especial consideration, an electric vehicle department was organized for the purpose of stimulating interest in the use of such conveyances, and increasing the demand for them.

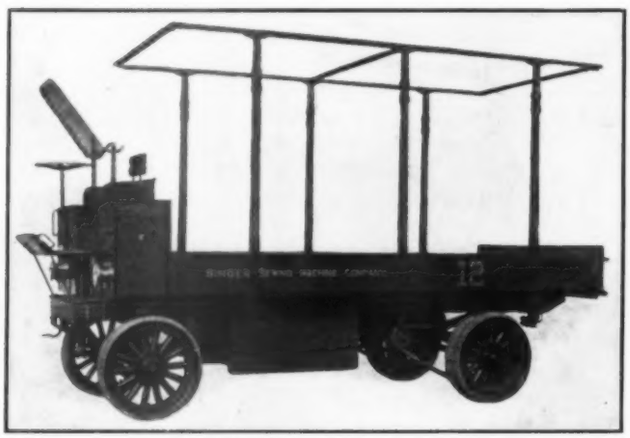
For more than a year the Edison Company has been conducting an active advertising campaign of an educational character, setting forth the advantages of the "electrics." The company's house organ, the *Edison Monthly*, has devoted several pages each month to illustrations and descriptions of the various types of electric automobiles and accessories, and has given general suggestions for their economical operation and maintenance.

Early in the beginning of the campaign a letter was sent to local users of electric machines announcing that the vehicle department would be glad to act in an advisory capacity, and in this manner personal acquaintances were formed, many difficulties and complications being thus adjusted.

It was found that frequently more current was used in charging than was absolutely necessary, or that vehicles were not handled as economically as possible. These difficulties the automobile engineer adjusted to the satisfaction of the customers.

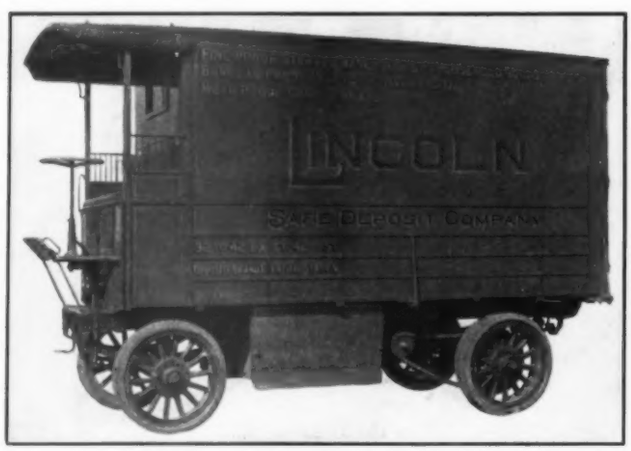
A list of users of horse-drawn vehicles was compiled, and to the firms whose business seemed to warrant an equipment of "electrics," a series of follow-up letters were sent explaining their advantages. Upon the receipt of a reply the writer of the letter was promptly interviewed, and any desired information or suggestions given. When deemed advisable, if permission was secured, the name of the interested person was given to the several manufacterers of electric vehicles who are represented in New York. The automobile engineer is in a position at all times to give figures showing the comparative cost of operation of horse-drawn, gasoline and electric vehicles.

The New York Edison Company itself operates seventy electric vehicles in its transportation department, and therefore is able to impress upon prospects the fact that arguments made in favor of the "electric" are based upon

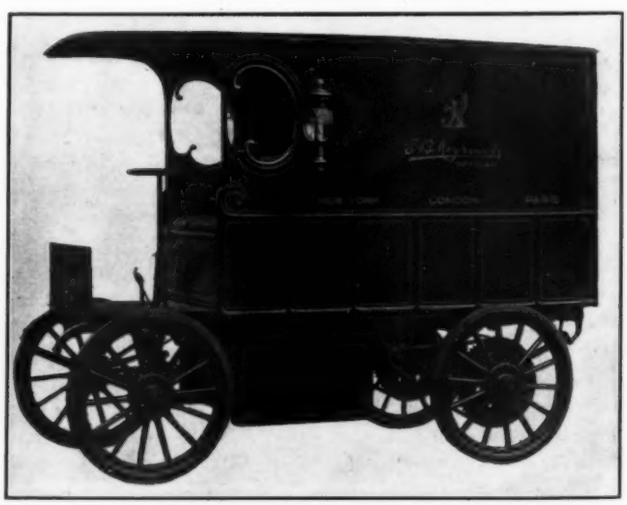


FIVE-TON ELECTRIC TRUCK.

TWO-TON ELECTRIC TRUCK.




THREE-TON ELECTRIC BANK VAN.



1,000-POUND ELECTRIC DELIVERY WAGON.

the actual experience of a number of years. A statement has been prepared showing what records are kept and the method of keeping them. The vehicles are also described, giving the capacity of each, what it is used for, the type of battery, average daily mileage on one charge, and the life of the plates.

Emergency charging plugs have been installed in all of the Company's substations, thereby increasing the number of charging points in the city by thirty per cent.

A map has been prepared showing the location of charging stations in the city and environs, together with a list. Good roads, and the distance to various points are indicated. This map has been mailed to every local user of electric automobiles, and a supply is kept on hand for general distribution.

The results from advertisements in the daily press have been excellent, indicating that sincere interest has been awakened in the use of "electrics" for both pleasure and business purposes.

In the Borough of Manhattan direct current is supplied to the automobile customers and most of the charging current is taken from the 120-volt main using an ordinary direct current charging panel. Where the difference between the voltage of the 120-volt main and the required charging current is great, and where a considerable number of vehicles are to be charged, a motor-generator set is installed.

The automobile and storage battery contract of the company grants a maximum rate of six cents a kilowatt-hour, graduating down to three cents as the monthly consumption increases.

It is extremely gratifying to note that during the past year the number of electric vehicles in operation in this city has increased ten per cent, and that the consumption of current for charging purposes has increased to at least a corresponding amount.

### Condensing Water Decision.

Following a decision of Judge Jones of the United States court the Citizens' Light, Heat and Power Company of Montgomery, Ala., declared its intention to supply water to corporations. There was previously a question as to whether the company had a corporate right to sell its condensing water. P. R. Whiting, manager of the company, has now announced that he will supply this water to railroads and industries of Montgomery.

### A Method of Rendering Harmless a High-Tension Transmission Wire in Case of Breakage.

The accompanying diagram indicates in a general way the plan that is being followed by the Hydro-Electric Power Commission, of Canada, to render a transmission wire harmless if it should break at any point between stations and the loose ends should fall to the ground.

The diagram and text are both taken from the *Canadian Electrical News*. The drawing represents two consecutive stations, as it may be St. Marys and London, connected by three high-tension transmission cables. Running parallel with these cables on a separate pole line (in actual fact the telephone poles are used) are three smaller wires, each of which is supplied with a weak current by small capacity transformers, one at either station, these being fed by one or other of the three main transmission cables, as shown. Each of these small circuits operates, at either station, one pole of a three-pole relay used on occasion to close a short, strong, local-battery circuit. In case of accident to one of the main lines, which will produce a marked change in the strength of the current through the small-capacity transformers on that particular line, a large momentary current is induced in the corresponding relay line which operates the relay at both ends and closes the two local-battery circuits; these, in turn, excite powerful electromagnets which open the main line oil switches at the two terminal the relay lines, as will be seen, are star-connected at each station and earthed.

It will be seen further, that this scheme of installation is a safeguard not only against breakages in the transmission cables, but also equally against short-circuits. If two wires should by chance become crossed or otherwise short-circuited the result would be a sudden increase in current strength which would produce a corresponding instantaneous increase in the relay, so that the local circuits and the electromagnets would operate as before.

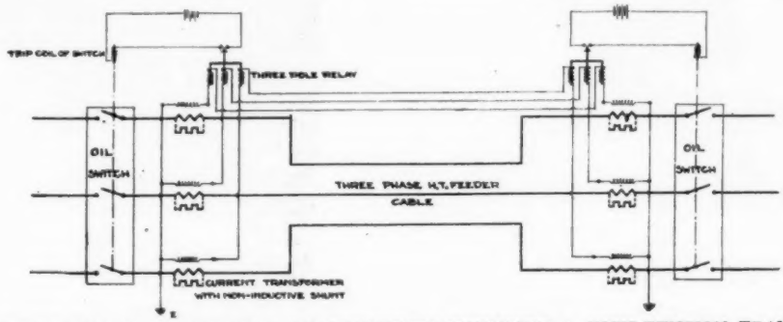



DIAGRAM SHOWING A METHOD OF RENDERING HARMLESS A HIGH-TENSION TRANSMISSION WIRE IN CASE OF BREAKAGE.

### Care of High Voltage Insulators.

Some instructions on the care of high-voltage insulators are given in a recent issue of the *Journal of Electricity, Power and Gas*, by J. O. Hansen, superintendent of the Pacific Gas and Electric Company's San Jose Power Division.

On the system of the Pacific Gas and Electric Company, says Mr. Hansen, there are more than 100,000 high-voltage insulators. Their efficiency must be great to avoid an average of one breakdown a week, and even that is too frequent. But at this rate the average life of an insulator would be nearly 1,000 years. This, of course, is not reckoning on breaks due to mechanical causes. The small boy with a stone is often the most frequent cause for a mechanic on the job, and the small boy is closely seconded by the unsuccessful hunter who must use his ammunition on something.

A few hundred insulators put under test will undoubtedly make a satisfactory showing. But there must be very general great reliability for all climatic conditions. In the intensely foggy and windy climate about San Francisco bay insulators are things that require careful watching and attention. Insulators made to stand a rain or wet test will render good service in fog and wind when they are clean, but, when dirty, their insulating quality becomes much impaired.

The heavy winter rains keep the insulators clean a part of the year. Dur-

ing a dry spell of from one to two months so much dirt will have collected on the insulators that when they become wet there will be enough current leak over to fire the pole. The soft redwood or cedar pole itself catches fire much more easily than the pine cross-arms. When iron pins are used, and are shorted by wire, the leakage current may be entirely between the wires over the insulators or the leak may be between a wire and the ground, and then fire the pole. But by running the shorting wire to the ground, the pole is thoroughly protected from such burning. Still the leakage current is present, and, if allowed to become large enough, through the wetting of the accumulated dirt by fogs or light rains, an arc forms which either shatters the insulator or burns the transmission wire in two. In the majority of cases either of these accidents is easier to repair than a burned pole. With the iron insulator pins shorted and grounded, more current and consequently a greater accumulation of dirt and dampness are required to start trouble, so that more time can be allowed between cleanings of the insulators. The dirt accumulates over all parts of the insulator in an even layer. But an insulator that has been on the line through the winter has more dirt left on the protected parts than on the exposed parts where the rain has washed some of it off.

For this reason the suspension type of insulator is better than the pin insulators, because in the suspension type a larger-percentage of the entire surface may be washed off by the rains. The method of supporting by a large clamp is also probably better than by a small tie wire on the pin insulators, because of the difference in corona discharges from small and large diameter surfaces.

First dry cloths were used in cleaning the insulataors. Later it was found more effective to apply gasoline on the cloths to cut the dirt and grease. But because gasoline evaporates so quickly kerosene is now being used with good results. The best cleaning is with clear water applied with a hose. All parts are then washed off without any residue being left on the surface.

An insulator made to hold up under all of the dirt that will accumulate on it during a season and have its surface so exposed that the winter rains will thoroughly clean it, should give satisfactory results.

**Lecture and Lantern Slide Demonstration at Fremont, Ohio.**

The Fremont Yaryan Company, of Fremont, Ohio, tendered a lecture and lantern slide demonstration at the Opera House, Fremont, on the evening of March 23, to a large gathering of central-station men, manufacturers and patrons. The moving spirit in the development of the evening's entertainment was T. H. Jungk, president of the Fremont Yaryan Company, who was ably assisted by his staff of engineers, and a number of representatives of the engineering department of the National Electric Lamp Association, headed by S. E. Doane, chief engineer. Mr. Jungk was also assisted by J. Robert Crouse, L. P. Sawyer, H. H. Geary and other representative lamp manufacturers.

The meeting was opened with a brief address by J. Robert Crouse, who introduced S. E. Doane. Mr. Doane very briefly called attention to the widespread and beneficent influences of electricity and the desirability of a close adherence to a line of mutual co-operation between the central station, manufacturers and the consumers.

The meeting was then turned over to the illuminating engineers from the engineering department of the National Electric Lamp Association, who delivered a number of excellent papers as follows: "Street Lighting," J. D. Hoit; "Residence and Business Lighting," J. G. Henninger; "Industrial Lighting," J. D. Hoit.

WINDOW DISPLAY OF THE FREMONT YARYAN COMPANY.

Fremont, Ohio, is a progressive town, with a population of about 10,000. Surrounded by a prosperous agricultural country, with a number of thriving industries located within its confines, it is an ideal location for a central station and district heating system.

Mr. Jungk has won the confidence of his fellow-townsmen, and in planning for a great increase in both the electrical and heating busines, it is his desire to co-operate closely with the city council and with his consumers. For this reason he prepared the lantern slide demonstration and lecture so that the people might become better acquainted with the utilitarian advantages of electricity for domestic lighting, and for heating and cooking; so that the shop keepers could learn something of interest and value to them respecting show-window lighting and store lighting; so that the manufacturers might learn how to properly differentiate between specific and general illumination; and so that the municipal authorities might discover what constituted good lighting where the conditions called for special treatment.

One of the features of the advertising service of the Fremont Yaryan Company is a window display, a reproduction of which is shown herewith. Along with examples of the most modern types of lighting units, Mr. Jungk has displayed a collection of devices showing the evolution of light sources from the pine knot to the electric bulb. Some of the candle molds and old lard oil lamps are very interesting, and the display attracts much attention from the enthusiastic residents of Fremont.

ELECTRIC LIGHTING and ILLUMINATING ENGINEERING

## ELECTRIC CAR LIGHTING.[1]—I.

BY J. R. SLOAN.

The advantages of electric over other forms of lighting for the passenger equipment of steam railroads are well known and briefly are as follows: (1) Great reduction in fire risk. (2) No vitiation of atmosphere. (3) Great decrease in heat generated by the lighting units on account of less total energy being consumed in the operation of the lamp and a greater percentage of that energy being utilized as light instead of appearing as heat. (4) Improvement in illumination, as electric lights can be placed where the best effects may be obtained, while with other forms of illumination their location is practically determined by the construction of the car. (5) Improved appearance of car.

While electric lighting, considering solely those items which go to making up the cost of producing the light, is undoubtedly more expensive than any other forms of illumination, it is a question in the minds of many railroad officials, whether this cost is really very much greater when account is taken of the damage resulting from wrecked cars taking fire, both personal and property. However this may be, the fact remains that the public is now demanding electric lights, and it remains for the railroads to determine how this demand can best be met.

There are three general systems that have been followed in electric train lighting steam passenger equipment, viz: The straight storage, the head end and the axle generator systems.

The first, or straight storage system, is the most simple to install and requires less intelligent labor for its successful operation. In this system each car is equipped with a set of storage batteries, generally thirty-two, although cars having twelve, forty-four and fifty-six cells of battery have been used. These batteries are connected directly to the mains of the distributing switchboard, and consequently the lamp voltage and the brilliancy of the light are functions of the condition of charge of the battery.

This system is not, however, applicable as a general proposition, on account of the following limitations:

(1) The battery must be of such a size that the demands upon it are well within its capacity. In considering this question of capacity of battery, it should be remembered that a decrease in temperature causes a temporary decrease in the battery capacity. Unfortunately, this falling off in capacity comes during the winter, at the very time when the demands on the battery, due to short days, are greatest.

(2) The layover of the car must be sufficient to allow the batteries to be charged. It is obvious that the straight storage system cannot be successfully used if the cars are operated on a schedule that does not permit the charging of the battery, unless the discharged set is replaced with a fully charged set.

(3) The layover yard should be of a size and design, and the make-up of the incoming and outgoing trains such, that it will not be necessary to move the car and interrupt the charging, but to obtain those conditions in practice is almost impossible, unless great expense for extra yard room and equipment is incurred.

When carbon-filament lamps were the only lamps to be obtained, the low efficiency resulted in a heavy demand on the battery, which seriously limited the application of this system. With the advent of the metalized filament, then of the tantalum, and later of the tungsten lamps, these limits have been extended, and it is now possible to light cars on runs, which with the carbon lamp it was imposible to operate.

In order that a straight storage system of electric lighting be successful it is necessary that the terminal yards be provided with an adequate system of wiring, so that the batteries may be placed on charge wherever the car may stand in the yard. Ample generating capacity should be installed, so that the placing of cars on charge need not be delayed due to lack of power. As a result of the inadequate facilities that are usually provided, the percentage of failures of light on cars operated on the straight storage system is greater than it should be.

The life and candlepower of an incandescent lamp are functions of the voltage, but the percentage change of life and candlepower is much greater than the percentage change of voltage, and the decrease of candlepower, due to this variation of voltage, has been the cause of considerable complaint. In order to obtain a reasonable candlepower when the battery was nearly discharged, it has been customary to use a lamp that would give normal candlepower at the average voltage, which for thirty-two cells of battery is about sixty-three volts. The higher voltage to which the lamps are subjected with the battery fully charged, results in decreasing their life, by causing the bulbs to blacken, and the filaments to burn out, thus greatly increasing the cost of operation.

So far as the writer is aware no attempts toward regulating the voltage, and consequently the candlepower of the lamps, have been made when using the straight storage system, although it is perfectly feasible to do so. The reason for this probably is, that to do so, entails a loss of power, and the amount of power available is limited.

The second system mentioned, the head end, has generally been considered as applicable only to certain cars operated in what may be called "solid trains," that is, trains in which the cars are kept together to a more or less extent from one terminal to the other, although it frequently happens that cars are kept together to a more or less extent from one terminal to the other, although it frequently happens that cars are picked up and dropped en route.

This system has been installed in a

[1] Abstract of a paper read before the Central Railway Club, New York City, March 11, 1910

variety of ways, viz: (1) Engine or turbine-driven generator set in baggage car, taking steam from the locomotive, train lines and batteries on each car. (2) Engine or turbine-driven generator set in baggage car, taking steam from the locomotive, train lines on each car and batteries on one or more cars. (3) Engine-driven generator set in special car equipped with steam boiler, and train lines on each car. (4) Turbine generator set mounted on locomotive, taking steam from the locomotive, lamp and battery booster on tender, train lines and batteries on each car. (5) Turbine generator set mounted on locomotive, taking steam from locomotive and train lines on each car.

No matter how installed it requires that each car be equipped with train-line wires and means for connecting these wires on adjacent cars.

When this system is used without batteries, it follows that whenever the generator is not operating, there is no light.

The difficulties of this system as generally used are as follows: (1) Steam pressure insufficient and supplied for only part of time. (2) Steam hose bursting or leaking at coupling. (3) Difference in voltage in the various cars, due to difference in "drop" in train line wires. (4) When batteries are used, excess voltage on lamps due to difference in charge and discharge voltage of batteries.

In order to equalize the potential on the different cars as much as possible it is customary to run one wire direct from one terminal of the generator to the roof of the train, where it is connected by a "jumper," to a wire leading to the fore part of the train, to which are connected one terminal of the batteries and lamp mains on the various cars. The other terminal of the generator is connected to a wire which leads back from the forward part of the train and is correspondingly connected to the other terminal of the batteries and lamp mains on the various cars. This serves to equalize the potential between cars having the same relative position with respect to the two ends of the train, but the end cars have a greater potential than the center cars and in long trains this difference of potential is appreciable, and is noticeable on account of the difference in the brilliancy of the lights.

When batteries are used in connection with the head end system, another difficulty, due to difference in voltage is encountered. This is the difference between the voltage necessary to charge a set of batteries and the voltage of same set on discharge.

It is customary to use a lamp that will give normal candlepower at the average condition of discharge, or sixty-three volts, and the batteries and lamps being connected in multiple, it follows that if the generator be operated at a voltage sufficient to charge the batteries this voltage will be destructive to the lamps, while if operated at normal lamp voltage, the batteries will not only not receive charge, but will actually discharge. It is, therefore, customary to run at a compromise voltage, about sixty-six volts at the lamps when they are burning, and when not, to raise the voltage to a point sufficient to charge the battery.

Since the last of these systems has been brought out, in connection with axle generators, that could readily be used with the head end system, and would overcome the difficulty in regard to the difference in potential between the batteries in a charged and discharged condition.

It is believed that the use of this system will not extend very much beyond the present stage, at least, on Eastern roads. *(To be continued.)*

### The Handling of Tungsten Lamps.

The lamp committee of the National Electric Light Associatieon has presented some interesting data in the N E. L. A. *Bulletin* for March on the handling of tungsten lamps. It has been prepared by H. B. Gear, of the Commonwealth Edison Company, of Chicago, at the request of the committee.

The introduction of high-efficiency incandescent lamps has brought about a novel situation in the electric lighting industry and one which necessitates a readjustment of policies of long standing as regards the installation and renewal of incandescent lamps. A reduction of fifty to sixty per cent in the consumption of electricity for a given candlepower, coupled with an increase in the cost of the lamp itself of 300 to 400 per cent, calls for an immediate change in such policies if the interest of the lighting company is to be conserved. The problem is, therefore, two-fold,—(*a*) how shall the reduction of energy consumption be checked, and (*b*) how shall the lighting company be reimbursed for the increased cost of lamps?

The reduction of energy consumption may be checked by encouraging increased standards of illumination among existing users of electric light, and by the creation of new business where other forms of illumination have been in use heretofore. The experience of gas companies in increasing the standard of illumination without largely decreasing the consumption of gas when the Welsbach mantle was introduced, has demonstrated that it is quite possible to accomplish results along this line which will prevent existing customers from taking the full benefit of the reduced energy consumption in changing from carbon to tungsten lamps. The various schemes which are being tried to accomplish this result depend largely upon rates and local conditions, so that no general rules can be formulated, beyond the suggestion that the increased amount of light received from a given amount of electricity should be made to produce new business where other illuminants have been in use heretofore.

The high cost of tungsten lamps and the fragile nature of the filament necessitate some means of charging the consumer for lamp installations and renewals, which shall be in proportion to the number and size of lamps used. This cannot be readily done by adding to the rate charged per kilowatt-hour for electricity in most instances, for various reasons. It has been done in a few cases where four-light tungsten clusters are furnished on a special form of contract, which requires a separate meter for the tungsten lighting; but in general this is impossible because of the use of carbon lamps and other current-consuming devices on the same meter with tungsten lamps.

Where the central-station company does not furnish the first installation of carbon lamps free of charge, the tungsten lamp is sold to the consumer outright, in some cases at regular rates and in other cases at reduced rates which are approximately equal to the cost of the tungsten lamps.

The practice of charging the customer the full retail price tends to encourage the installation of lamps of as low voltage as the customer can use, and therefore results in greater loss of income than is the case where it is made easy for the customer to get larger size of lamps. Where the first installation

of carbon lamps and renewals are furnished free, tungsten lamps may be furnished at a reduction of from five cents to ten cents below company cost, to give the customer the benefit of the carbon lamp which he would otherwise have used. It seems wise not to allow the customer the full benefit of the price of the carbon lamp, as the percentage of breakage of tungsten lamps is higher than with carbon lamps, as well as the unit cost of the lamps themselves. For instance, if a group of customers uses 1000 tungsten lamps during a stated period in place of 1000 carbon lamps, the loss by breakage might be about five per cent or fifty lamps. Assuming that the tungsten lamps were distributed between the twenty-five, forty, and sixty-watt sizes, the average cost of broken lamps would be perhaps sixty cents. The value of the fifty lamps would therefore be about $30. This is euivalent to an extra cost of three cents per lamp on 1000 lamps, and must therefore be allowed for in fixing the amount which the customer is to be allowed, in view of the fact that he does not use carbon lamps.

Actual experience in handling the tungsten lamps in large quantities indicates that the total breakage in shipment from the factory to the company's store room and delivery from the store room to the customer's premises by messenger, does not greatly exceed five per cent. The process of transportation from the company's store room to the consumer's premises is a difficult one, and is necessarily expensive. Tungsten lamps may be delivered in the original packages by wagon, where they are required in standard package quantities, with reasonable success. After they are delivered to the premises, however, they must be unpacked and placed in the sockets by experienced men.

In handling the calls for lamps in small quantities from all parts of the city the most practical method seems to be to provide carrying cases which men can take in their hands on a street car or on foot, answering a number of calls on one trip. About 800 to 1000 calls per week, aggregating from 5000 to 6000 lamps of all sizes, are handled in this way in Chicago at an expense of about three and one-half cents per lamp for labor and transportation.

This is considerably greater than the cost of delivering carbon lamp renewals by delivery wagon, on account of the fact that the calls are widely scattered; and the messenger installs the lamps in the customer's sockets in order to be sure that the lamp is left in good operating condition.

The average number of calls made by messengers in outlying parts of Chicago is about ten per day, the down-town messenger making from fourteen to sixteen calls per day. The average number of lamps delivered per call is between five and six.

### Glare, Its Causes and Effects.

The March number of *The Illuminating Engineer* (London, Eng.), the official organ of the Illuminating Engineering Society, also of London, Eng., contains under the above caption an editorial dealing with the discussion on the subject of glare which was taken up at the February 15 meeting of the Illuminating Engineering Society. An abstract of this follows:

"It was freely admitted that practically all of the sources of the present day, when placed so that their rays fall direct on the eye, cause a painful and prejudicial effect. This possibility we must therefore avoid. We may do so by introducing a diffusing globe or screen cutting down the intrinsic brilliancy to the desired value, or in some cases by so placing the source a considerable distance away that the eye will never, or, at least, rarely, be able to recive the direct rays. In addition it is necessary to make special provision to prevent the possibility of reflected light from shiny surfaces coming into the eye, and so interfering with vision.

"As regards the maximum permissible intrinsic brilliancy of sources which are liable to be exposed to the eye, there is some difference in opinion, but, on the whole, surprisingly good agreement. The figure suggested by Doctor Stockhausen is about 4.5 candlepower per square inch. That advocated by Prof. L. Weber and Dr. Louis Bell is about 2.5 candlepower per square inch, while A. P. Trotter also thinks that a value in this neighborhood would be satisfactory. On the other hand, it may be recalled that a few workers, like J. E. Woodell, have considered even lower figures desirable, and the last named, at the second convention of the American Illuminating Engineering Society in 1908, thought that 0.2 candlepower per square inch was not too low a limit.

"This general recognition of the nature and causes of glare and of the need for special precautions to avoid it, is in itself evidence of a welcome change of view during the last few years. There still remain many questions of detail which are not completely understood and require further study, but we believe that meanwhile this collection of opinions on the subject of glare will have a very influential effect in drawing the attention of the public to the matter, and will stimulate the desire for more scientific methods of illumination."

### Chicago Section of the Illuminating Engineering Society.

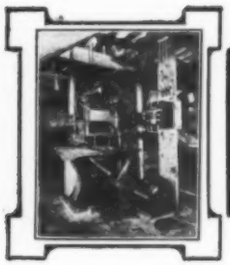
At the noonday luncheon of the Chicago Section of the Illuminating Engineering Society, held on Thursday, March 4, at the Great Northern Hotel, Albert J. Marshall, consulting and designing engineer of New York city, read a very interesting paper on public school room lighting.

A number of stereopticon slides were used to illustrate the conditions prevailing in the school room

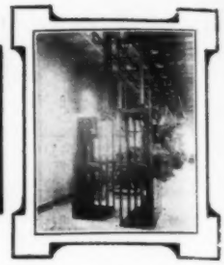
In the lighting tests conducted by Mr. Marshall, the school room was divided into several squares and an illuminometer measurement made in each of these squares. Readings were taken with various lamps and reflectors at many positions. In addition to this, a reading was taken at the center of each pupil's desk. The scheme finally installed was one having six lights to a room, these being put in two rows.

Mr. Marshall also spoke of two systems of lighting which are at present being investigated. In one of these the lights are placed in a long box which is fastened to the ceiling. Both sides of the box are opaque, while the bottom is made of prismatic glass, so designed as to give the best diffusion of light. The lights in the other system are placed in the corner made by the wall and the ceiling.

Doctor Gradle, in discussing the paper, spoke highly of indirect illumination as being the really natural method of lighting. Mr. Marshall replied by saying that while this was undoubtedly the case for outside work, or work not requiring close application, it was not the best light for writing, reading or drafting. The point was also raised that there is no light more tiring or painful to the eye than the light of a fog which is so reflected that it enters the eye from every possible angle.



# Industrial Power



### The Water Supply System for the Central of Georgia Railway's Macon Shops.

Among the advantages peculiar to electric pumping, there is the possibility of locating the delivery apparatus, practically unattended, directly at the intake site, and at any reasonable distance from the source of power, the control station, and the point of delivery.

A good example of such flexibility in disposing the links of a small water supply system is the motor-driven pumping equipment for the locomotive and freight car repair shops of the Central of Georgia Railway at Macon. The installation of this plant has resulted in assuring a generous supply of water at all times, for general use and fire-protection service, besides substantially reducing the cost of each thousand gallons compared with the price when the supply was purchased.

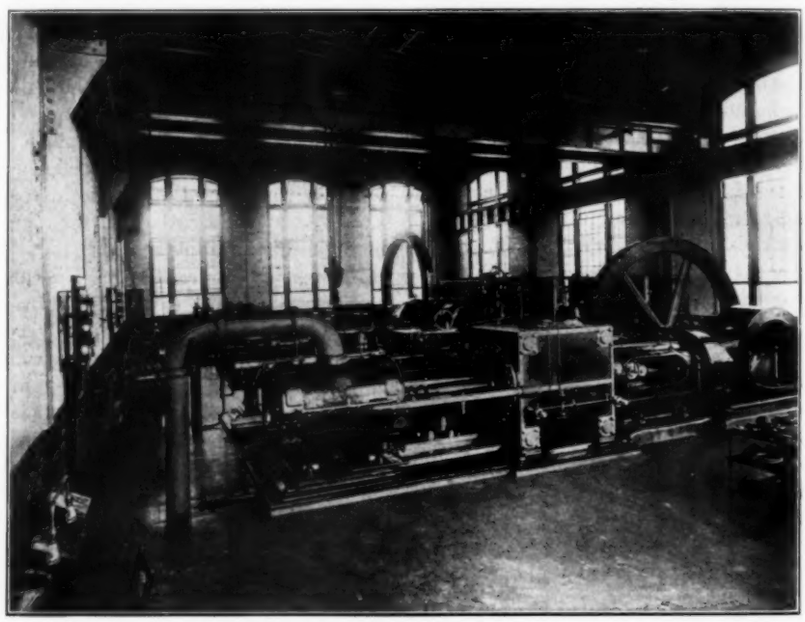
The present private water supply system of the Macon shops comprises a motor-driven pumping station on the bank of the Ocmulgee River, nearly a mile from the shops and power plant, from which it derives its power supply, and to which in return it delivers 600,000 gallons of water per twenty-four hours, against a head of fifty-five feet. No attendant is maintained at the pump house, the machinery being controlled from the power plant in the shop group of buildings in accordance with automatic indicating and recording devices.

The duty required of the pumping plant is the supply of water for general use about the shops and property, fire protection for the buildings, condensing water for the power plant boilers, and water for the locomotives,—aggregating in all about 600,000 gallons daily. Chemically, the water of the Ocmulgee River is quite good from a boiler standpoint, but during flood seasons it carries large quantities of sediment and sand which must be allowed to precipitate out before the fluid can be employed industrially. The presence of this foreign matter in the intake water during certain seasons of the year dictated the selection of impeller pumps for this installation, and the operation under these severe conditions has been entirely satisfactory.

The river water is first lifted into a reservoir at the shop site, from which it is distributed by gravity flow to its several destinations. From the reservoir, the raw water is used in the power-station condenser, and that portion of the condenser overflow which is needed is then filtered and treated for boiler use.

led in from a screened intake well, while the pumps discharge into a sixteen-inch main leading to the reservoir at the shop, the level of which is fifty-five feet above the normal stage of the river.

The pump motors are controlled from the power house, independent supply circuits being provided for each machine. This arrangement was found to be simpler and very little more expensive than the scheme of installing automatic starters at the pumping station, with control circuits to the power



INTERIOR OF POWER PLANT OF THE CENTRAL OF GEORGIA RAILWAY'S MACON SHOPS

The pump house on the bank of the Ocmulgee River, 4,200 feet distant from the shop, is a circular structure containing three motor-driven, horizontal-shaft, single-stage turbine pumps, each having a capacity of 1,200 gallons per minute. Each pump is direct-connected to a forty-horsepower, 2,000-volt, three-phase, sixty-cycle, Westinghouse induction motor running at 1,120 revolutions a minute. The pumps are fitted with bronze impellers and bronze diffusion veins, securing improved durability and efficiency. The suction line is

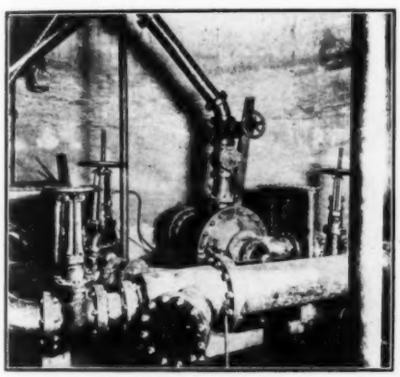
house. The starting panels for the motors are equipped with ammeters, indicating the current consumed by each unit, while in the main circuit there is included a Westinghouse graphic recording wattmeter which registers the total power consumed. As a rough but constant relation obtains between the water discharged by a turbine pump and the power taken to drive it, the graphic meter record thus affords a convenient means of totaling the amount of water pumped by the plant. The starting panels carry a graphic gauge

showing the water level in the reservoir, and by watching this the power house attendant is able to regulate the delivery of the pumps to the supply rate required.

A motor-driven valve in the main entering the reservoir is also operated from a controller at the power station, completing the concentration of control of the entire pumping system at these panels.

In the power plant the circulation pumps draw from the reservoir directly, and the overflow from the condensers is then taken, as needed, through filtration equipment supplying water for the engine terminal and shops. In the settling basin the water is treated with sulphate of aluminum, precipitating the suspended matter.

The general service pumps comprise a duplex simple steam pump with capacity for delivering 700 gallons a minute, and a turbine pump direct-connected to a direct-current motor, having the same rated delivery. The steam pump is pressed into service when its exhaust can be employed to advantage in heating water for the plant boilers or for filling the locomotives. When this exhaust steam cannot be thus fully utilized, it is found, of course, more economical and convenient to run the electrical pump. The control of this equipment is all automatic.



MOTOR-DRIVEN PUMP.

The electrical engineer for the Central of Georgia Railway Company is E. M. Rhett, under whose direction the electrical and pumping equipment of the Macon shops was installed.

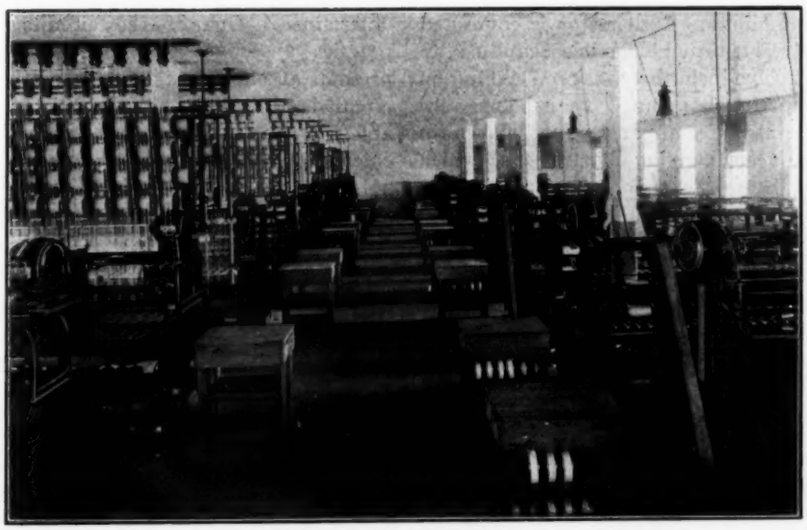
### German Cable Extended.

The new extension of the German Government's cable line from Teneriffe, Canary Islands, to Monrovia, Liberia, has been opened. Eventually the cable will be extended to South America.

### Electric Drive in an American Textile Mill.

The accompanying illustration is an interior view recently taken in the plant of the Warren Featherbone Company, at Three Oaks, Mich. This progressive and up-to-date concern manufacturers textile products which are well known in every place in this country where women's clothes are sold.

As may be noted from the illustration, individual electric drive is used throughout. Thus the customary objectionable line shafting is eliminated and the number of costly and dangerous belts is reduced to a minimum, doing away with dirt and dust which would be stirred up by flying belts, not to mention the great reduction in the noise associated with the textile machinery and the higher speeds and efficiency obtainable by the electric drive. The compact and neat design of the motors may be noted by a comparison of the size of any of the motors with that of the machine it operates.



INDIVIDUAL MOTOR DRIVE IN AMERICAN TEXTILE MILL.

The plant was equipped with electric drive in 1905, and high-efficiency motors manufactured by the Peerless Electric Company, Warren, Ohio, are used throughout. During the five years the installation has been under practical test, it has given the greatest satisfaction, the economy of production and the quality of the product have been increased, and better conditions under which the employes now work have tended greatly to improve the efficiency of the working force.

The cleanliness and general bright appearance of the factory are apparent.

### Electricity in Lumber Handling.

In a recent issue of the *American Lumberman*, of Chicago, Ill., a writer points out that the adoption of electrical methods in handling lumber was occasioned by the necessity of seeking a method of operation which should be cheaper than manual labor. In lumber operations, the writer states, electricity has a number of advantages over any other form of mechanical power, among them being the low cost of installation, the elimination of fire hazard and the doing away with the expense when work is not actually being performed.

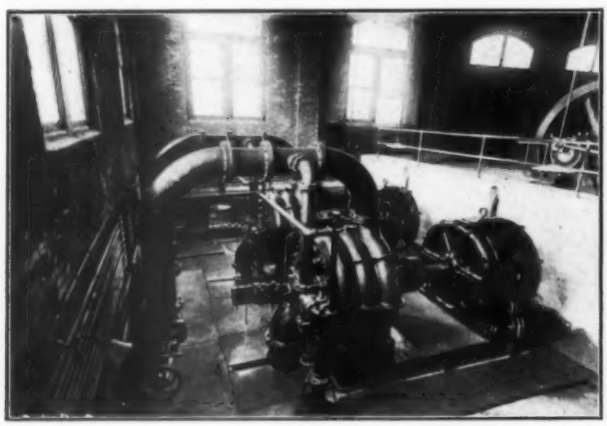
A comparatively recent development in the direction of the mechanical handling of lumber is the electrical monorail system. The practical results of this system obtained in the plant in which it was installed are, that the lumber after leaving the sorting sheds, is handled in units of 1,500 feet instead of piece by piece. Binders of three by three or four by four material are placed over the top at each end of the units to keep the boards in alinement and to prevent spreading as the hoist raises and conveys the unit from place to place. The four arms, or lumber tongs, each of which is formed into a hook at the lower end, take a firm hold under the crosspieces upon which the unit rests and carry the unit supported on these crosspieces. The tongs are controlled from an operator's cage, enabling him to take hold, hoist, convey, lower and release lumber without the aid of a ground man.

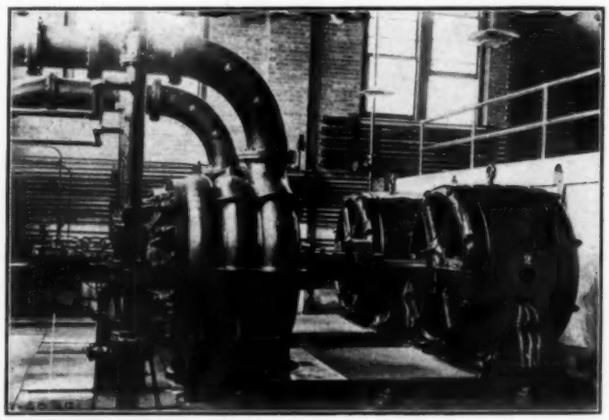
It is also stated that when the monorail system is not in operation there is

no expense—the electric current, by which it is entirely operated, being shut off. When the system is in operation the cost of the current is small and one man does the work of ten, keeping it up hour after hour.

**Motor-Driven Pumps at Depew, N. Y.**

The city of Depew, N. Y., is furnished with water from Lake Erie by two 300-horsepower, electrically driven, centrifugal pumping sets. The electrical equipment of this waterworks station comprises two 300-horsepower, 400-volt, three-phase, twenty-five-cycle Westinghouse type "CCL" induction motors, operating at 480 revolutions per minute. Each motor is connected directly, through flexible couplings, to a twelve-inch, three-stage Worthington centrifugal pump. The motors are operated from panels (not shown in the accompanying illustrations) which carry the auto-starter switches, recording gauges, voltmeters, wattmeters, etc. An average meter reading shows the duty of each motor, when fully loaded, to be 270 kilowatts or 320 horsepower. This electrical equipment in the Depew and Lake Erie pumping plant replaced expensive and bulky steam pumping machinery, and the resulting improved economy has fully justified the claims for superior efficiency which induced the change in motive power and the scrapping of a lot of valuable machinery. The steam pumps may still be used to advantage, however, during the cold months of the year, when the exhaust steam can be disposed of profitably by use in steam-heating systems. Such use, in fact, has become almost the remaining utility of such steam-driven apparatus, where electric power is available.





MOTOR-DRIVEN PUMPS AT DEPEW, N. Y.

**The Ferrié Frequency Meter.**

A new frequency meter invented by Commander Ferrié was shown and described at a recent meeting of the French Academy of Science. The apparatus has the general appearance of a switchboard voltmeter or ammeter, but has two indicating needles that are movable around two diametrically opposite points in extremely near planes, without being able to touch. Their crossing point observed with reference to the scale on the dial indicates the measurement. The apparatus comprises two circuits, both connected in parallel to the alternating-current source, the frequency of which is to be determined. One of the circuits is practically free of self-induction and presents an ohmic resistance; the other circuit is of negligible ohmic resistance and possesses a self-induction, the coefficient of which is supposed to be constant within the limits of measurement of the instrument. The instrument comprises two thermal galvanometers, one of negligible resistance and the other of negligible self-induction. The galvanometers are connected one in each circuit, and their needles furnish the desired indication by their crossing point, as stated above. By using suitable auxiliary circuits and displacing the zero position of the needles, frequency meters of varying ranges may be obtained; or by certain precautions in the constitution of the circuits and galvanometers the frequency meter may be made applicable to high-frequency currents and thus becomes a wave meter. Resistance, inductances and capacities can also be measured with a similar instrument by replacing at least one of the auxiliary circuits by the element to be measured or by comparative standards.—*Translated and abstracted from L'Industrie Electrique (Paris), February 10.*

**Electrically Operated Locks for Barge Canal.**

Electrical equipment for the operation of locks on the New York barge canal is to be installed immediately in certain cases to that completed locks shall be ready for operation during the coming season of navigation. Locks on the state canal system have always heretofore been operated by hand, but the barge canal locks, which must be large enough to lock through the thousand-ton barges, will be twice as wide and three times as long as the old single lock; hence the change to electricity for the operation of the lock gates, filling of lock chambers, etc. State Engineer Williams has prepared plans and specifications under which Superintendent F. C. Stevens, of the state department of public works, will advertise for proposals for installing the electrical equipment on three locks at Whitehall, on the Champlain Canal, one at Baldwinsville, on the Erie, and four on the Oswego Canal. Engineers estimate that this equipment for the eight locks will cost $180,000.

**To Discuss Power Transmission at St. Louis.**

In view of the fact that the problems of the transmission of electrical energy have not received the proper amount of study in the past, there will be especial attention given them at the St. Louis meeting of the National Electric Light Association.

As is pointed out in a recent issue of the National Electric Light Association Bulletin, several sessions will be held

to discuss the commercial side of power transmission. A committee now has the matter in charge, and is laying out the work to be done at the power-transmission meetings.

Should it be decided at these sessions that there is need of a Power Transmission section, steps will be taken toward its formation.

### Economy Transformers.

Some interesting facts concerning so-called economy or auto-transformers, which may not be generally known, are reprinted by the *Elektrotechnische Zeitschrift* from the "Periodical Communications" of the Oerlikon Company. In auto-transformers the low-tension winding is joined in series with the high-tension winding. Under certain conditions the conducting connection between the two windings may raise the pressure in the low-tension circuit against the ground to the value of the high-tension circuit. For this reason, when single-phase current is employed, one pole of the high and low-tension

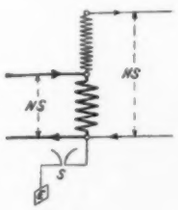



FIG. 1.

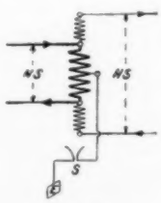



FIG. 2.

windings must be provided with a safety device, as shown in Fig. 1, or the low-tension windings must be protected at the centre or connected to the ground, as at *S* in Fig. 2. In single-phase installations such ground connections should, in general, not be introduced without special consideration. When polyphase transformers with star connection according to diagram Fig. 3 are used, the common zero point of both windings may in all cases be grounded in order to prevent the occurrence of high pressure in the low-tension circuit. If the circuit leading to the ground includes a safety device, as a horn lightning arrester or spark gap, the device must be adjusted so that it operates as soon as the pressure between low-tension poles and the ground surpasses a certain limit, as forty per cent above the normal. If the low-tension circuit is protected by one of these two methods against the occurrence of high tension, the arrangement of the auto-transformers possesses no disadvantages as compared with ordinary two-spool transformers; as regards the size of the windings, the auto-transformer even possesses considerable advantages. If the ratio of transformation between high and low tension is $n$, the capacity of an auto-transformer will be higher in the ratio $n/(n-1)$ compared with that of an ordinary transformer of equal weight and price. Thus, if the ratio of transformation is two to one, a given type of transformer, when

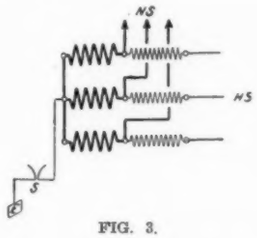



FIG. 3.

used as an auto-transformer, will have double the capacity; if the ratio of transformation be one and one-fifth to one, the increase in capacity will be sixfold. The use of auto instead of ordinary transformers is therefore particularly advisable in polyphase systems with star connection and grounded neutral point, for low ratios of transformation. Figs. 4 and 5 illustrate some special circuit arrangements for polyphase transformers in which the advantages of primary and secondary triangle connection are combined with those of the auto-transformer. The primary and secondary windings of each phase are here joined in series, and the phases together in a triangle. Fig. 4 shows

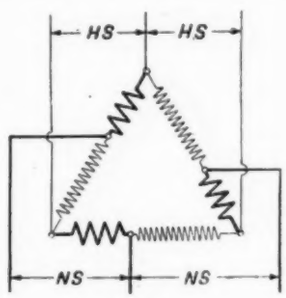



FIG. 5.

the connections for a line with six conductors, and Fig. 5 for one with three conductors on the low-tension side. A transformer wound in this manner compensates to a certain degree dissymmetries in the distribution of the tension, which may be caused by an uneven secondary load, for instance. In this last arrangement the ratio of transformation should not be higher than two to one. Arc-lamp transformers, tension dividers, so-called step transformers for starting closed-circuit motors, etc., are forms of auto-transformers.

### Moving-Picture Decision.

In a decision handed down last week by the United States Circuit Court for the Southern District of New York in an injunction suit against three makers of moving-picture films for show purposes, the rights of the Edison Company to the exclusive exploitation of this product are again affirmed.

The decision grants temporary injunctions against the only two New York companies still making films for general use which had failed to obtain the Edison Company's approval before advertising their wares. It brings to an end a warfare over patent rights that has extended through eleven years,

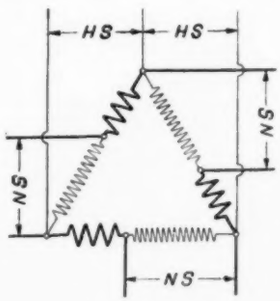



FIG. 4.

and leaves the Motion Pictures Patents Company in supreme control. This is a holding company organized by the Edison and Biograph companies to prosecute patent infringements and to buy up outstanding patents held by the moving-picture operators. The company is now only a year old, but it has already prosecuted several suits.

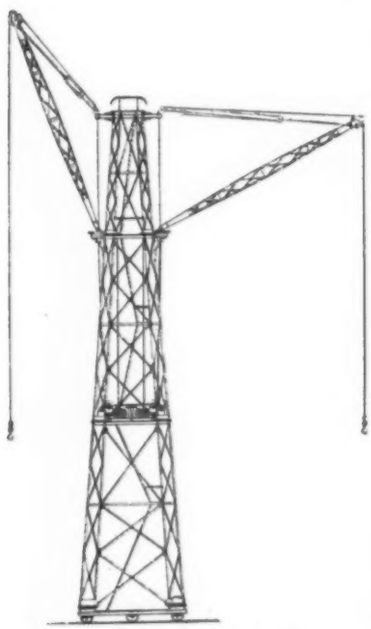
The defendants in the suit were Carl Laemmle, the Independent Moving Picture Company of America, and the Pantograph Company. Their defense was that not Edison, but a man named Greene, was the real inventor of the apparatus in moving-picture machines by which they are enabled to take a continuous photograph of actors and other subjects in action at top speed.

Justice Noyes, who filed the memorandum of the decision, held that the arguments as to Greene had been exhausted in a previous suit, and that the Circuit Court of Appeals had decided that the Edison patents were valid. For that reason, he said, he was disposed to grant a preliminary injunction.

### An Electric Tower Crane.

The accompanying diagram illustrates an electric tower crane which was used in making some recent extensions to the British Museum, in London, England.

The tower is made up in three sections, the divisions being made at the platform carrying the motors and gearing, and at the platform which supports the soleplates from which the two jibs of the crane spring. The tower, as a whole, may be regarded as built up from four corner towers having each a rectangular cross-section of four feet by three feet at their base and



ELECTRIC TOWER CRANE.

of eighteen inches square at their highest point. Each of these corner towers has a height of ninety-eight feet six inches, and is built up of four angles braced together diagonally and across by flat bars and gusset plates. Half way up each of the three sections, the main tower is divided by a cross-piece composed of plates which is introduced to give rigidity against torsional forces. The base of the tower is carried on a six-wheel truck made up of rolled-steel joists, angles and plates. A motor is fixed on this carriage and drives the rail wheels through gearing. At the top of the first section, a height of thirty feet from the ground, are fixed the motors which drive the hoisting, slewing and jibbing motions, each motion being operated by a separate motor of twenty horsepower capacity. All the movements of the crane, including the traveling, are controlled from the motor floor seventy-five feet from the ground. Each jib of the crane is forty-five feet in length, and can be swung through an arc of 180 degrees. It is stated that the crane has performed the following operations. At the maximum radius of each jib a load of three tons was raised at a rate of eighty-five feet per minute, while at the seventeen feet radius the crane dealt with a weight of eight tons, the hoisting speed in this case being thirty-six feet per minute. The jibs can be used simultaneously, and when this is done each can deal with a three-ton load at any radius to the maximum. Forty-five seconds are required to bring the jibs from their maximum to their minimum radius, while to slew them through their greatest arc, thirty seconds are required, the traveling speed being fifty feet per minute.

Acknowledgment is due to the London *Electrician* for the above particulars.

### Changes in the National Electric Code.

Commissioner Thompson of the department of water supply, gas and electricity announces the following changes in the National Electrical Code, as heretofore adopted for use in the city of New York:

Rule *31-A*, *b-5* has been modified to read as follows:

Stage pockets must be of approved type controlled from switchboard, each receptable to be of not less than thirty-five amperes rating for arc lights or fifteen amperes rating for incandescent lights, and each receptacle to be wired with a separate circuit to its full capacity. Arc and incandescent receptacles must be placed in separate pockets, and each pocket cover or face plate must bear some mark to distinguish between the two classes of pockets. Where practicable, arc and incandescent plugs shall be so designed as to be noninterchangeable.

The following rule, to be known as section *h* of rule *26* has been adopted:

Must be so constructed as to render the splices accessible for purpose of inspection, or in lieu thereof must be inspected and labeled at the factory.

By means of an attractive souvenir post-card the Denver Gas and Electric Company, Denver, Colo., announces that it will deliver to each customer, for a free trial of thirty days, an electric toaster.

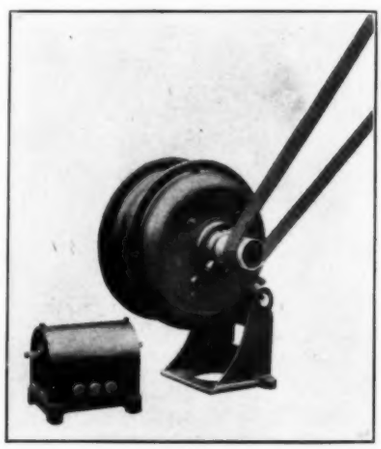
This method of familiarizing the public with the advantages of electric cooking appliances has been found exceedingly successful, providing the proper medium has been selected for making the announcements concerning these offers.

### A New Suspension for Motors Driving Textile Mills.

It is the common practice in designing motors for the individual driving of testile mills, to use the weight of the engine in order to obtain the necessary tension of the transmission belt.

According to this process, the engine is hinged from a special bracket and its weight is partially compensated by a spring acting on the opposite side of the engine opposite to the suspension. This design is bad in that it does not insure a perfect and uniform tension of the belt, unless the spring is regulated whenever the belt looses appreciably.

With the new design shown in the accompanying illustration, this defect is corrected by putting a spiral spring on the suspension itself, this spring giving a constant pull for all positions of the



SUSPENSION FOR TEXTILE MILL MOTOR.

engine between + 50° and —50°, on either side of the middle plane.

The illustration shows the engine with its controlling device, which may also be fixed on the bracket.

This type of motor (induction motor) is now put on the market in Europe for powers of one-third, two-thirds and one horsepower.

Secretary Ballinger has temporarily withdrawn 56,659 acres of public lands from all forms of disposition in aid of proposed legislation affecting the disposal of waterpower sites on the public domain. The withdrawals are located as follows: 42,459 acres along Yampa, Colorado; 3,560 acres along White River, Colorado; 5,480 acres along Grape Creek, Colorado; 2,240 acres along Deschutes River, Oregon; 1,720 acres along Willow Creek, Oregon, and 1,200 acres along Bear River, Wyoming.

# TELEGRAPHY—TELEPHONY, and WIRELESS.

## The Colin-Jeance System of Wireless Telephony.

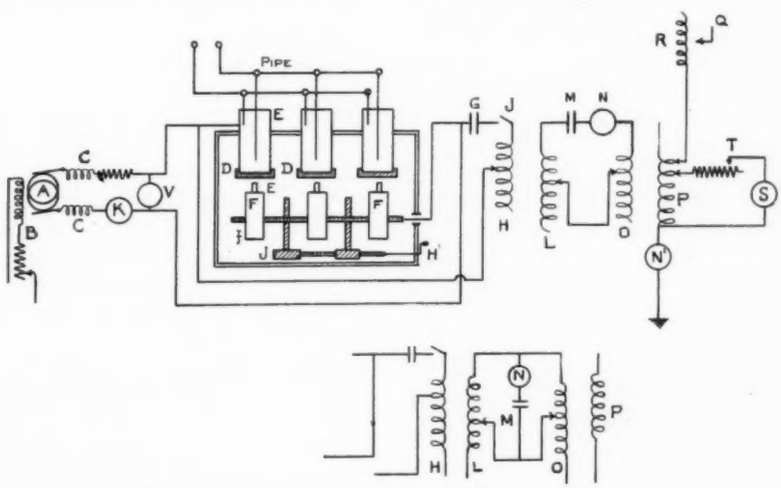
It will be remembered that Lieutenants Colin and Jeance, of the French Navy, did some interesting work in the wireless telephone field with a new instrument devised by them, and succeeded in covering long distances upon the Mediterranean. Their invention was kept secret for a long time, but we are now able to give the present account of it which has been recently published.

The inventors use a number of arcs between copper and carbon electrodes. These burn in air or else in hydrogen, coal gas, ammonia, acetylene, etc., or in liquids such as water, oils and various hydrocarbons. We also have an ensemble of circuits for producing simple undamped oscillations, together with a microphone transmitter. Any kind of detector can be used for receiving, such as the electrolytic, andion, perikon, etc. The dimensions of the receiver should be properly determined.

Referring to the diagram, we have the direct-current generator *A*, excited variably at *B* so as to work at constant speed and obtain suitable changes of voltage. On the switchboard are two choke coils *C C* and a rheostat *D* in the circuit of the arc. As to the arc device, the inventors employ one or a number of arcs *A* contained in a suitable box, this being filled with gas or liquid. At the upper part of the positive electrodes, which are cylindrical reservoirs *C* of copper and of large diameter. They are cooled by the circulation of a liquid within them coming by the upper pipes and working on the gravity-cooling principle. Water or an insulating liquid can be used. The bottom of the cylinder is a cap *D* in the form of a heavy metal plate which is used as an electrode for the arc, and these upper electrodes remain in a fixed position. Below are the negative electrodes *E*, which are thin carbon rods of one to three millimetres diameter. They are mounted on a cylindrical and winged radiator *F*, or a large carbon can be used for the purpose. Such support has a sliding fit in a common plate or frame which holds the series of electrodes, and the frame is raised or lowered by two vertical screws, these in turn being worked by the worm gear *J* and the handle $H^1$ lying outside the box. At H an automatic regulator can be applied. In this way we regulate the length of all the arcs at the same time. When arcs are used in free air the lower carbons can be of large diameter.

Connected with the arcs in series there is a first circuit which contains a variable capacity *G* and a self-induction *H*, also variable. A voltmeter *V* is mounted across the arc terminals, and a switch *J* breaks the circuit. A second or intermediate circuit contains the variable self-induction *L*, and this is used to form the secondary of a Tesla transformer, whose primary coil is the self-induction coil *H* of the first circuit. We also have the variable condenser *M*, the ammeter *N* and the variable self-induction coil *O*, which forms the primary of a second Tesla transformer. Lastly, we have a variable self-induction *P*, which is the secondary of the second Tesla transformer, and it has one side grounded through the ammeter $N^1$. A properly chosen point on the self-induction *P* is connected to the antenna *Q* by means of an adjustable induction coil *R*.

The microphone *S* has one end connected to ground and the other end of its circuit is coupled at a chosen point on the Tesla coil. In this circuit is a variable resistance *T* and an ammeter. Instead of a single microphone the inventors employ a great number of microphones in series, and a variable number of microphones are connected in the circuit by means of a commutating switch. All the microphones are mounted on a common base and have a common chamber leading to the ear-piece. Below will be seen a variation of the present connections between *H* and *P*.




THE COLIN-JEANCE WIRELESS TELEPHONE SYSTEM.

## Discount in Telephone Rates Upheld by the Supreme Court of the United States.

The Appellate Division of the Supreme Court held, in a decision against a department store which had refused to pay its telephone bill on the ground that it was discriminatory, that the New York & New Jersey Telephone Company has the right to give a discount of twenty-five per cent net to the city, charitable institutions and clergymen. The decision is one of considerable importance.

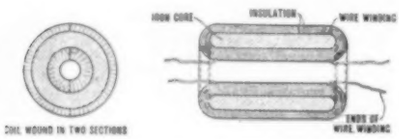
## NEW TELEPHONE CABLE BETWEEN ENGLAND AND FRANCE.

THE FIRST SUBMARINE CABLE WITH PUPIN COILS.

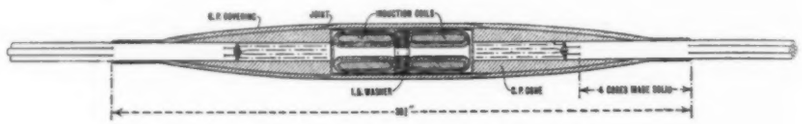
The following interesting account (with diagrams) of the first submarine telephone cable to be equipped with Pupin coils is taken from the March 17 issue of our English contemporary *Electrical Engineering*.

A new telephone cable will shortly be laid between England and France to supplement those now employed for the telephone service between London and Paris. As a result of negotiations between the two countries, it was decided that two new cables should be laid, each containing four wires (two circuits). One cable will be laid by each government; but while the French cable will probably be more or less of the same type as those already in use, the British one (which is already manufactured and is waiting at Siemens Brothers & Company's works at Woolwich for a favorable opportunity for laying it) embodies the most recent improvement in the design of long distance telephone lines, viz., the insertion of "loading" coils at intervals along its length. Instead of its scope being limited to conversations between London and Paris, it has been designed so that it will be possible to converse through it between Paris and all the large towns in the Midlands and North of England, and even to Glasgow, by utilizing the existing land-lines. Tests show that the electrical properties of the cable predetermined by the designers have been accurately fulfilled, and it is reasonable to expect that, when once the cable is taken into use between Paris and London the extension of the telephone service to the North will be carried out as soon as the necessary traffic arrangements have been completed by the authorities. The cable will be laid by the makers, Siemens Brothers & Company, from Abbots Cliff, halfway between Dover and Folkestone, to Cape Gris Nez.

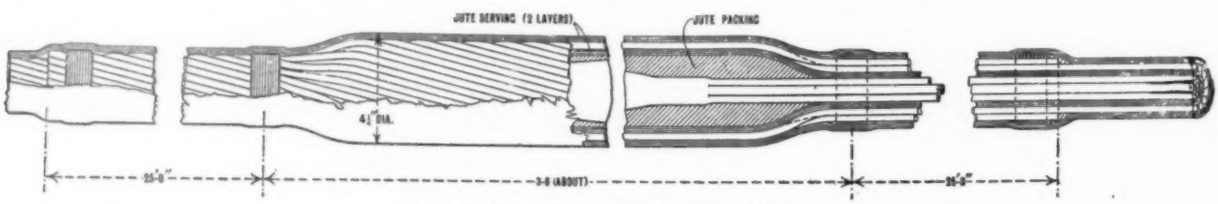
This cable will be the first submarine cable in which "loading," or inductance, coils are distributed throughout its length on the Heaviside-Pupin principle. It is the outcome of the experimental work of W. Dieselhorst, the works manager of Siemens Brothers & Company's cable works at Woolwich. It was Mr. Dieselhorst who laid the lead-covered cable with loading coils in the Lake of Constance in 1906, and he then realized the difficulty that would be experienced in dealing with lead-covered cable in submarine work owing to its great weight and the damage which would be caused to a lead cable in tidal waters. On his return to the Woolwich works he immediately started experiments on the insertion of loading coils in gutta-percha-covered cables, and a method of doing this, which is that in use in a slightly modified form in the new Anglo-French cable, was patented by him, in conjunction with his firm, in November, 1906 (British patent 23,306/06). An experimental cable made in this way at the Woolwich works was left in water for fifteen months, and occasionally subjected to pressures of four tons per square inch, corresponding to a depth of 2,500 fathoms of water. This cable was found to withstand these tests without injury, and was brought to the attention of the Post Office engineering staff. Finally, when tenders were invited for a loaded cable for laying across the English Channel, Siemens Brothers & Company were able to guarantee a standard cable equivalent length of 3.5 miles for the total length of twenty-one nauts (24.2 miles), and their tender was accepted. The tests of the cable after manufacture have shown that the actual cable has a standard cable equivalent of 3.28 miles, which is still better than the guaranteed figure. Without loading coils, a mile of the same cable has a standard equivalent cable length of 0.435 mile, and therefore the actual gain due to the addition of loading coils is equivalent, in its effect on the speech transmitted, to reducing the length of the cable 3.2 times. The cable is a four-core cable with conductors weighing 160 pounds to the mile, insulated with 300 pounds (per mile) gutta-percha, the resistance of the conductors per loop mile is 12.5 ohms, and the wire to wire capacity 0.12 microfarad per mile. The inductance coils, each of slightly less than six ohms resitance, with an inductance of 0.1 henry at 750 cycles per second, are placed at one naut (1.153 miles) apart. The actual attenuation constant of the cable is 0.140 per mile, while the cable without its inductance coils has an attenuation constant of 0.045 per mile. As the cable and coils were designed for an attenuation constant of 0.0147 after preliminary experiments had been made, the closeness to this figure is extremely satisfactory.




INDUCTION COIL.




ARRANGEMENT OF COILS IN CABLE.




METHOD OF SHEATHING OVER COILS.

In the insertion of loading coils in a submarine cable, the mechanical problem is even more important than the electrical one, and the makers are to be congratulated on their solution of this. The coils have been inserted so compactly that the part of the cable containing them can be paid over a four-foot sheave without damage. Our illus-

trations show the design of the coils, and the method of inserting. They increase the diameter of the gutta-percha core from about one inch to three inches, a gutta-percha cone is inserted at each end as packing, and gutta-percha sheet is wrapped around them and jointed to the gutta-percha of the core at each end.

Those of our readers who remember the description of Messrs. Siemens' patent some months ago, will note that an alteration is now made in the arrangements of the loading coils. Instead of four coils inserted one after the other, one for each of the four wires of the cable, two double coils are employed. Each double coil consists of two windings on the same iron core, and one winding is connected in series with each conductor. This has an advantage over four distinct coils, as the iron core experiences an ageing effect which affects its permeability, and may not be precisely the same in two cores. If separate coils on separate iron cores were used for the go and return circuit, the gradual change in permeability might disturb the even balance of the circuit, but by winding them on the same core the variations are automatically compensated. Between the silk-covered wire of the coils and the gutta-percha sheet there is a sheet of metal foil, not shown in the drawing; this was found to be a necessary precaution in the construction of the cable, and has been patented. An annular rubber distance-piece is inserted between the two sets of coils to give greater flexibility.

The method of armoring is extremely ingenious. At about ten yards before the position of the coils is reached, the stranding machine is stopped, and a second armoring is started on the top of the other one. When the bulge in the cable is reached the wires of the second armoring, which, of course, is given the same lay as the first, automatically place themselves between the other wires, so that the part of the cable with the increased diameter is covered with a single layer of the armoring wires, and at about ten yards on the other side of the coils the additional wires are cut and bound up as before.

Major O'Meara, the Engineer-in-Chief of the Post Office, is to be congratulated in having adopted this type of cable in the face of much criticism by Continental experts. It has been stated freely that the high specific inductive capacity of gutta-percha would render a cable insulated with this material unsuitable for loading with coils, and that the calculations employed in the design would therefore be falsified. The tests already alluded to have shown, however, that this is far from being the case, and some tests made by the Post Office engineers last October and November on some of the Danish Government "continuous loading" is far more effective. The "continuous loading" consists of covering the copper conductor with a close spiral winding of thin iron wire throughout its length. Obviously this cannot increase the inductance to the same extent as the insertion of coils at intervals, and at the same time it materially increases the capacity of the cable. Actual measurements against standard cable compared with the values calculated for the same cables as those under test, but without the continuous iron winding, showed that the improvement due to the "continuous loading" was about sixty per cent, whereas with coil loading an improvement of from 250 to 370 per cent has been shown to be practicable in the Post Office cables in England—the former by experiments with gutta-percha cables, and the latter with paper-insulated cables.

### To Regulate Wireless.

Two bills regulating the sending of wireless messages have been favorably reported to the House by the committee having them under consideration.

One of these bills provides that government messages should have precedence over all others excepting distress signals from vessels. The other bill which was reported on by the House naval committee provides for a board of seven members to regulate the sending of all wireless messages.

### Marconi Company to Reduce Stock.

For the purpose of saving about $4,500 a year in taxes the directors of the Marconi Wireless Telegraph Company of America have recommended a reduction in the par value of the capital stock from $100 to $25 a share. Stockholders were informed that the directors considered the capital stock, $6,650,000, excessive and a useless burden. Stockholders were asked to vote on the proposed reduction.

The company's report for the year ending January 31, 1910, shows a net profit of $3,701 after deducting $12,936 from the gross working profits for depreciation. Traffic receipts for the year increased $25,532. One hundred and twenty steamers plying the Atlantic have been added to the list equipped with the Marconi system during the year.

### Meeting of the American Supply and Machinery Manufacturers' Association.

The executive committee of the National Supply and Machinery Dealers' Association and the American Supply and Machinery Manufacturers' Association announces a joint meeting at Atlantic City, N. J., on May 11, 12 and 13.

The headquarters hotel has not yet been selected, and it is expected that it will be announced within the next ten days. It is also expected that special rates will be secured for delegates.

### Pacific Coast Electrical Exposition.

It has been announced that the Pacific Coast Electrical Exposition will be opened on Saturday, May 21, 1910.

During the past two weeks plans have been completed for the decorations and the arrangement of exhibits, and now that the date has been set these plans will be put into effect immediately.

The Executive Committee of the Pacific Coast Exposition is E. M. Scribner, chairman; W. W. Briggs, vice-chairman; John R. Cole, W. L. Goodwin and R. B. Elder. The secretary is Albert H. Elliott, and D. M. Moses is general manager, with headquarters at 34 Ellis Street, San Francisco, Cal.

### Examinations for New York Public Service Commission.

Examinations are to be conducted by the New York State Civil Service Commission on April 30, for the positions of assistant electrical engineer and assistant inspector of gas, Public Service Commission, Second District. The former position pays from $600 to $900, the latter from $1,080 to $1,200.

The big Clement-Bayard airship, which is now under construction in France, is to be fitted with the C. A. V. system of electric lighting by variable-speed dynamo. The current will be used to illuminate the various instruments in the car, and also for the headlights.

## FINANCIAL REPORTS OF ELECTRICAL COMPANIES.

The report of the Kings County Electric Light and Power Company, for the month of February and two months ended February 28, compares as follows:

| | 1910 | 1909 |
|---|---|---|
| February gross | $339,413 | $297,499 |
| Expenses | 159,700 | 141,772 |
| February net | $179,713 | $155,726 |
| Charges | 93,036 | 83,615 |
| February surplus | $ 86,657 | $ 72,111 |
| Two months gross | 732,631 | 648,205 |
| Expenses | 328,005 | 290,282 |
| Two months net | $404,626 | $357,922 |
| Charges | 199,327 | 180,031 |
| Two months surplus | $205,299 | $177,891 |

### KANSAS CITY RAILWAY AND LIGHT.

The annual report of the Kansas City Railway and Light Company for the year ended May 31, 1909, has been issued. The income account compares as follows:

| | 1909 | 1908 |
|---|---|---|
| Gross | $6,627,977 | $6,070,117 |
| Expenses | 3,764,788 | 3,228,174 |
| Net | $2,863,789 | $2,841,943 |
| Other income | 5,642 | 105,680 |
| Total income | $2,868,831 | $2,947,623 |
| Adjusted by accounts | ..... | 23,918 |
| Total income | $2,868,831 | $2,923,705 |
| Charges, etc. | 2,004,742 | 2,070,577 |
| Net income | $ 864,088 | $ 853,128 |
| Dividends | 476,105 | 470,353 |
| Surplus | *$387,983 | $ 382,775 |
| Previous surplus | 680,601 | 846,205 |
| Total surplus | $1,068,604 | $1,228,980 |
| Depreciation, etc. | 400,000 | 548,379 |
| Profit and loss surplus | $ 668,604 | $ 680,601 |

*After allowing for full five per cent dividend on the $9,522,160 outstanding preferred stock, the balance, $387,983 (before appropriations for depreciation) is equal to four per cent on $9,635,580 outstanding common.

### PIONEER TELEPHONE COMPANY.

The report of the Pioneer Telephone Company for the year ended December 31, 1909, compares as follows:

| | 1909 | 1908 |
|---|---|---|
| Gross revenue | $1,534,180 | $1,356,703 |
| Expenses, taxes and interest | 1,259,775 | 1,187,852 |
| Net increase | $274,405 | $ 168,851 |
| Dividends | 250,392 | 146,100 |
| Surplus | $ 24,013 | $ 22,751 |

*Equal to 6.10 per cent on $4,493,000 capital stock, comparing with 7.03 per cent earned on $2,401,700 stock last year.

### ELECTRIC STORAGE BATTERY.

The Electric Storage Battery Company has issued its annual report for the year ended Dec. 31, 1909. The income account compares as follows:

| | 1909 | 1908 |
|---|---|---|
| †Gross sales | $1,218,483 | $ 845,705 |
| Operating expenses | 384,021 | 315,180 |
| Net | $ 834,461 | $ 530,525 |
| Other income | 99,030 | 106,054 |
| Total net income | ‡$933,492 | $ 636,579 |
| Dividends | 528,092 | 528,092 |
| Surplus | $ 405,398 | $ 108,487 |
| Previous surplus | 2,003,678 | 3,669,327 |
| *Less adjusted, net | 50,260 | 1,774,136 |
| Total surplus | $2,358,816 | $2,003,678 |

*Included in 1908 $1,940,000 depreciation Electric Vehicle securities and $223,450 increment plant appraisement above book value.

†Gross sales, less cost of manufacturing, etc.

‡Equal to 5.18 per cent on the $18,000,000 stock ($189,900 preferred) comparing with 3.53 per cent earned on same stock last year.

### AMERICAN LIGHT AND TRACTION.

The report of the American Light and Traction Company, for the month of February and two months ended February 28, compares as follows:

| | 1910 | 1909 |
|---|---|---|
| February gross | $311,549 | $283,922 |
| Expenses | 9,285 | 8,568 |
| February net | $302,264 | $275,354 |
| Two months gross | 690,824 | 607,688 |
| Expenses | 17,786 | 17,402 |
| Two months net | $673,038 | $590,286 |

### CHICAGO CITY RAILWAY.

The Chicago City Railway Company's report for the year ended January 31, 1910, compares as follows

| | 12 mos. end Jan. 31, '10 | 13 mos. end Jan. 31, '09 |
|---|---|---|
| Passenger revenue | $8,735,704 | $8,979,735 |
| Other sources | 358,343 | 216,047 |
| Total revenue | $9,094,047 | $9,195,782 |
| Expenses, taxes, renewals, interest | 8,230,734 | 8,169,494 |
| Net operating revenue | $ 863,313 | $1,026,288 |
| City, 55 per cent | 474,823 | 564,458 |
| Company, 45 per cent | $ 388,490 | $ 461,830 |
| Interest on capital | 1,864,901 | 1,732,446 |
| Income from operating | 2,253,392 | 2,194,276 |
| Other income | 555,714 | 655,206 |
| Total income | $2,809,107 | $2,849,482 |
| Interest on bonds | 1,110,666 | 849,739 |
| Net income | $1,698,440 | $1,999,743 |
| Dividends | 1,080,000 | 1,620,000 |
| Surplus | $ 618,440 | $ 379,743 |
| Per cent net to stock | 9.44 | 11.11 |

The Chicago City Railway Company's balance sheet as of January 31, 1910, is exhibited as follows:

ASSETS.

| | |
|---|---|
| Purchase price | $38,507,294 |
| Advances for construction | 1,066,624 |
| Bonds in treasury | 1,041,867 |
| Cash | 1,801,800 |
| Total | $42,418,587 |

LIABILITIES.

| | |
|---|---|
| First mortgage bonds | $22,500,000 |
| Accounts payable | 598,695 |
| Surplus( assets, represented in equity of $18,000,000 capital | 19,319,891 |
| Total | $42,418,587 |

President Mitten says:

"The completion of work required during the rehabilitation period ended April 15, 1910, together with extensions already authorized for the current year, will entail an expenditure exceeding $1,500,000. The necessary funds are now in the treasury and specifically set apart for this purpose.

"The resulting balance sheet of January 31, 1910, shows a purchase price of over $40,000,000.

"Book value of capital stock is $19,319,891, representing only cash assets and purchase price of property, but does not include value of franchise."

### INTERBOROUGH RAPID TRANSIT.

The Interborough Rapid Transit Company has issued a monthly statement covering the earnings of the subway and elevated system for a period of eight months ending February 28, last.

Comparing the figures given for February, 1910, with the same month of the previous year, the following is shown:

| | 1910 | 1909 | Increases |
|---|---|---|---|
| Gross | $2,339,566 | $2,188,452 | $151,114 |
| Expenses | 879,043 | 855,666 | 23,377 |
| Net | $1,460,523 | $1,332,786 | $127,737 |
| Taxes | 134,391 | 118,812 | 15,579 |
| Income | $1,326,132 | $1,213,974 | $112,158 |
| Other income | 29,978 | 85,541 | *55,563 |
| Total income | $1,356,110 | $1,299,515 | $ 56,595 |
| Rentals, etc. | 869,792 | 855,305 | 114,487 |
| Net corporate income | $ 486,318 | $ 444,210 | $ 42,108 |
| Dividends | 262,500 | 262,500 | ..... |
| Surplus | $ 223,818 | $ 181,710 | $ 42,108 |

*Decrease.

### CENTRAL UNION TELEPHONE.

President Richardson, of the Central Union Telephone Company, at the annual meeting reported 1909 successful, with gross receipts of almost $5,000,000 and while net was almost wholly used in payment of interest and floating debt, the condition of the plant and business seemed to warrant expectation of dividends if the debt should be capitalized. Therefore, the directors submitted the plan for capitalization of floating debt by the organization of corporations in Ohio and Indiana, to which the properties now owned should be sold, leaving the Central Union Telephone in ownership and control of all of its properties in Illinois. It is expected thereby to place the Central Union and new corporations on a dividend basis in the near future.

Stockholders unanimously adopted the plan and gave the board authority to carry it into effect immediately.

The reports show as of December 31, connected with the lines of company 591,228 stations, including sub-licenses, a gain of 139,271 during the year.

The directors were re-elected.

### CHICAGO RAILWAYS.

The Chicago Railways Company has published its income statement (non-partnership account) for the year ended January 1, 1910, which compares as follows:

| | 1910 | 1909 |
|---|---|---|
| *Gross income | $3,084,736 | $2,739,302 |
| Deduct interest on bonds | 2,417,722 | 2,057,615 |
| Miscellaneous | ..... | 1,572 |
| Sinking fund | 250,000 | 250,000 |
| Corp. exp. & adj. | 153,084 | 124,140 |
| Total deductions | $2,820,807 | $2,433,327 |
| Net avail. for divisions | $ 263,929 | $ 305,975 |

*Consists of five percent investment, forty-five per cent Chicago Railways' share of net income from operation, and miscellaneous interest.

### KANSAS CITY RAILWAY AND LIGHT.

The report of the Kansas City Rail-

way and Light Company for the month of January and eight months ended January 31 compares as follows:

| | 1910 | 1909 |
|---|---|---|
| January gross | $ 611,919 | $ 550,947 |
| Expenses | 324,451 | 329,156 |
| January net | $ 287,468 | $ 221,791 |
| Charges and tax | 155,405 | 155,562 |
| January surplus | $ 132,063 | $ 66,228 |
| Eight months' gross | 4,785,616 | 4,418,573 |
| Expenses | 2,720,656 | 2,520,190 |
| Eight months net | $2,064,960 | $1,898,383 |
| Charges and tax | 1,264,931 | 1,262,135 |
| Eight months' surplus | $ 800,028 | $ 636,247 |

WESTERN UNION.

The Western Union Telegraph Company has issued its preliminary estimated statement of earnings for the quarter ending March 31, 1910, which compares for the same period of 1908 as follows:

| | *1910 | 1909 |
|---|---|---|
| Net revenue | $1,750,000 | $1,684,893 |
| Bond interest | 433,063 | 433,062 |
| Balance | $1,316,937 | $1,251,831 |
| Dividends | 747,639 | 747,198 |
| Surplus | $ 569,298 | $ 504,633 |
| Previous surplus | 18,584,497 | 16,077,905 |
| Total surplus | $19,153,737 | $16,582,538 |

*Estimated.

The actual figures of the Western Union Telegraph Company for the quarter ended December 31, 1909 compare as follows:

| | | |
|---|---|---|
| Net revenue | $1,747,200 | $1,930,064 |
| Bond interest | 433,063 | 433,063 |
| Balance | $1,314,137 | $1,497,002 |
| Dividends | 747,639 | 747,025 |
| Surplus | $ 566,498 | $ 749,976 |
| Previous surplus | 18,017,999 | 15,327,929 |
| Total surplus | $18,584,497 | $16,077,905 |

The earnings of the Western Union Telegraph Company (actual to December 31), for the nine months ended March 31, 1910, compare with the corresponding period of 1909 as follows:

| | 1910 | 1909 |
|---|---|---|
| Net revenue | $5,426,475 | $5,479,912 |
| Bond interest | 1,299,186 | 1,299,187 |
| Balance | $4,127,289 | $4,180,725 |
| Dividends | 2,242,828 | 1,992,043 |
| Surplus | $1,884,460 | $2,188,682 |
| Previous surplus | 17,269,278 | 14,393,857 |
| Total surplus | $19,153,738 | $16,582,539 |

TOLEDO RAILWAYS AND LIGHT.

The Toledo Railways and Light Company report for the month of January compares as follows:

| | 1910 | 1909 |
|---|---|---|
| January gross | $258,219 | $225,216 |
| Operating expenses | 151,762 | 130,059 |
| January net | $106,457 | $ 95,157 |
| Other income | 250 | 100 |
| Total income | $106,707 | $ 95,257 |
| Charges and taxes | 75,213 | 71,013 |
| Surplus | $ 31,494 | $24,244 |

NEW YORK SUBWAY GAINS.

The Interborough Rapid Transit Company has issued a financial statement covering the results of eight months of operation ending February 28, which showed heavy gains in traffic handled, and in gross and net earnings over the corresponding period ended February 28, 1909. In passengers carried the increase was 35,486,435 over the total for the eight months ended February 28, 1909, and the increase in surplus was $1,332,569 for the period.

The company carried in the eight months 365,893,457 passengers on all lines, which beats all records for a corresponding period in preceding years. In detail the figures show:

| Eight months ended Feb. 28— | 1910 | Inc. Over 1909 |
|---|---|---|
| Gross operating revenue | 18,851,863 | $1,801,772 |
| Operating expenses | 7,228,620 | 59,610 |
| Net operating revenue | $11,623,243 | $1,742,074 |
| Taxes | 1,120,053 | 74,564 |
| Income from operation | $10,503,189 | $1,816,637 |
| Non-operating income | 288,931 | 373,562 |
| Gross income | 10,792,121 | $1,443,075 |
| Interest, rentals, etc., including Manhattan guarantee | 7,028,865 | 110,506 |
| Net corporate income | $ 3,763,253 | $1,332,569 |
| Dividends on $25,000,000 Interborough Rapid Transit Company capital stock for eight months ended February 28, 1910, at the rate of 9 per cent per annum | 2,100,000 | ..... |
| Surplus | $ 1,663,255 | $1,332,569 |
| Operating per cent | 38.4% | 3.70% |
| Passengers carried | 365,893,457 | 35,486,435 |

NEW YORK PASSENGER TRANSIT GROWING.

A remarkable increase in the total number of passengers carried by the subway, Hudson River tunnels and street surface railroads of New York during last December, compared with the December of the previous year, is the feature of the traffic returns published by the New York Public Service Commission. The increase was 10,000,000, or a daily average increase of 325,000 passenger fares.

The figures of the passenger fares for the chief companies are as follows:

| | Dec., 1909 | Dec., 1908 |
|---|---|---|
| Interborough Subway | 25,401,082 | 22,712,358 |
| Interborough Elevated | 25,883,121 | 24,836,042 |
| Brooklyn Rapid Transit | 32,992,320 | 31,063,012 |
| Metropolitan Street Railway system | 24,232,178 | 23,409,410 |
| Third Avenue | 10,693,879 | 10,093,919 |
| Hudson and Manhattan | 4,056,403 | 1,407,804 |

The transportation revenue per car-mile comparatively was as follows:

| | Cents |
|---|---|
| Interborough Subway | 29.35 |
| Interborough Elevated | 23.61 |
| Brooklyn Rapid Transit | 25.94 |
| Metropolitan Street Railway system | 32.56 |
| Third Avenue | 27.57 |
| Hudson and Manhattan | 36.38 |

It is is noteworthy that the highest per car mile transportation, namely 38.29 cents, is shown by the Forty-second Street line, which is in the hands of a receiver. The Hudson & Manhattan comes next, and is followed by the Third Avenue, 35.10—under the management of Receiver Whitridge, the Metropolitan Street line being close behind with 34.97 cents.

WEST INDIA ELECTRIC.

The West India Electric Company, of Jamaica, has issued its report for the year ended December 31, 1909. The income account compares as follows:

| | 1909 | 1908 |
|---|---|---|
| Gross earnings | $236 065 | $217,411 |
| Expenses | 114,944 | 92,040 |
| Net earnings | $121,121 | $125,371 |
| Deductions: | | |
| Bond interest | $ 30,000 | $ 30,000 |
| Taxes | 7,236 | 7,045 |
| Rentals | 12,000 | 12,000 |
| Total deductions | $ 49,236 | $ 49,045 |
| Surplus | 71,885 | 76,326 |

UNITED RAILWAYS OF ST. LOUIS.

The report of the United Railways of St. Louis for the month of February and two months ended February 28 compares as follows:

| | 1910 |
|---|---|
| February gross | $ 807,439 |
| Expenses | 562,924 |
| February net | $ 244,515 |
| Charges | 233,276 |
| February surplus | $ 11,239 |
| Two months gross | 1,693,221 |
| Expenses | 1,159,068 |
| Two months net | $ 534,153 |
| Charges | 467,063 |
| Two months net | $ 67,090 |

MISSOURI AND KANSAS TELEPHONE.

The Missouri and Kansas Telephone Company, the Bell subsidiary operating in Missouri and Kansas, has issued its report for the year ended December 31, 1909. The income account compares as follows:

| | 1909 | 1908 |
|---|---|---|
| Gross | $2,859,161 | $2,653,148 |
| Expenses | 2,357,208 | 2,161,868 |
| Net | $ 501,953 | $ 491,280 |
| Interest and reserve | 817,201 | 761,607 |
| Deficit | $ 315,248 | $ 270,327 |
| Dividends | ..... | ..... |
| Deficit | $ 315,248 | $ 270,327 |
| Previous deficit | 260,069 | *10,258 |
| Total deficit | $ 575,317 | $ 260,069 |

*Surplus.

NASHVILLE RAILWAY AND LIGHT.

The report of the Nashville Railway and Light Company for the month of February and two months ended February 28 compares as follows:

| | 1910 | 1909 |
|---|---|---|
| February gross | $136,439 | $131,313 |
| Expenses and taxes | 76,417 | 76,514 |
| February net | $ 60,022 | $ 54,799 |
| Interest, depreciation and division | 48,200 | 46,816 |
| February surplus | $ 11,822 | $ 7,983 |
| Two months' gross | 285,038 | 270,283 |
| Expenses and taxes | 160,578 | 160,100 |
| Two months' net | $124,460 | $110,183 |
| Interest, depreciation and division | 96,766 | 93,864 |
| Two months' surplus | $ 27,694 | $ 16,319 |

Exports of copper for the week ended March 23 were 2,724 tons. Since March 1 they were 11,442 tons compared with 18,322 tons the same period last year.

# QUESTIONS and ANSWERS

CONNECTIONS FOR REVERSIBLE MOTORS.—Kindly show the connections of a series-wound reversible motor using different styles of switches, if it can be done with more than one style. Also show the connections of a compound-wound reversible motor with different styles of switches, if it can be done with more than one style.—F. M. S., Detroit, Mich.

In order to reverse a direct-current motor it is necessary to reverse the connections of either the armature or the field, but not of both at the same time. On account of the induction of the field, it is preferable to reverse the armature connections; for a compound motor this is also simpler. In Fig. 1 are shown the connections for a reversible series motor. A double-pole double-throw switch, connected as at 2, is best for reversing the armature A; a double-pole two-way switch could be used, however. The main line switch 1 is desirable, but not imperative, if the reversing switch 2 is used for stopping the motor as well as for changing its direction of rotation. The starting rheostat SR, shown here without overload or no-lease release for the sake of simplicity, may be connected directly to the armature or to the series field Se, as shown. Where a motor is to be reversed frequently, as in cranes, hoists, etc., the reversing switch and starting rheostat may be combined, as shown in Fig. 2. In this case the contact arm, which extends clear across the rheostat, has three contact shoes, as shown by the dotted lines; it can be swung at either side from its middle or "dead" point, at which point it short-circuits the field.

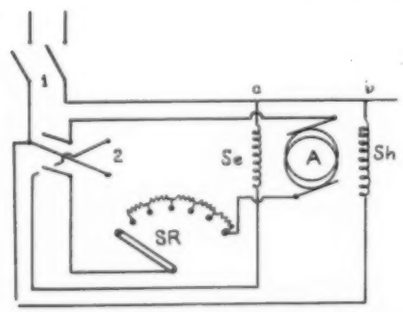



FIG. 1.—REVERSIBLE SERIES MOTOR.

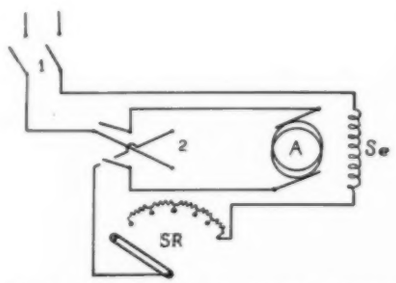



FIG. 3.—REVERSIBLE COMPOUND MOTOR.

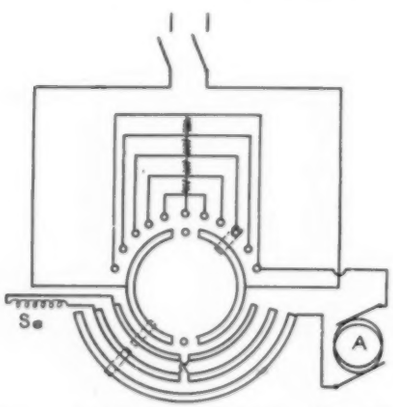



FIG. 2.—COMBINED STARTER AND REVERSER FOR SERIES MOTOR.

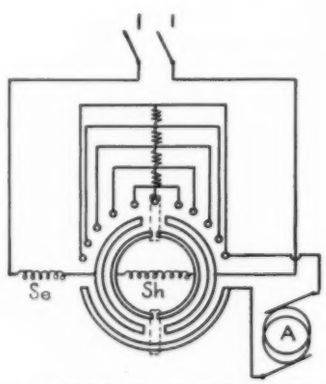



FIG. 4.—COMBINED STARTER AND REVERSER FOR COMPOUND MOTOR.

It will be noticed that the field is not reversed unless the polarity of the line terminals changes. In Fig. 3 are shown the connections of a reversible compound motor provided with both line switch 1 and reversing switch 2. As shown, this is a long-shunt motor; by removing the connection *a-b* and establishing a connection *b-c* it is changed to a short-shunt machine. Fig. 4 shows a combined reversing switch and starting rheostat for a compound motor that is to be reversed very frequently. The main field, shunt field Sh, is short-circuited as well as the armature at the "dead" point of the contact arm's position. If the resistances in Figs. 2 and 4 are heavy enough to carry full load current continuously, the device shown may be used for speed regulating, as well as starting and reversing.

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JOINT POLE LINES.—Why is it customary in joint pole lines, used by both electric light and telephone companies, to put the electric light wires above the telephone wires? I should think it ought to be the reverse.—D. O. L., La Salle, Ill.

The chief reasons for placing the electric light and power wires above telephone wires are: Linemen of the telephone company have to make frequent changes in the telephone circuits. According to the prevailing practice they do not have to come in contact with or interfere with the other wires, which may carry a fairly high potential; thus they are protected from possible injury due to lack of knowledge or foresight. The electric-light linemen, being accustomed to handling high-tension wires, can surely protect themselves from the low-tension telephone wires they have to crawl through to get to their own lines. The electric light wires are generally stronger than telephone wires, since they have to carry both larger currents and potentials, and therefore are less liable to break and fall across the wires beneath them.

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LARGEST TELEPHONE CABLES—What is the largest telephone cable made for regular service?—S. T., Atlanta, Ga.

The largest telephone cable as yet manufactured for regular service is one containing 600 pairs of wires. Its outside diameter over the lead sheath is two and five-eighths inches. It contains 1,200 copper wires of No. 22 B. & S. gauge. The wires are paper insulated and twisted in pairs.

# INDUSTRIAL SECTION

ILLUSTRATED DESCRIPTIONS OF NEW AND STANDARD ELECTRICAL AND MECHANICAL APPARATUS

**Recording the Output and Load Factor of Newspaper Presses Electrically.**

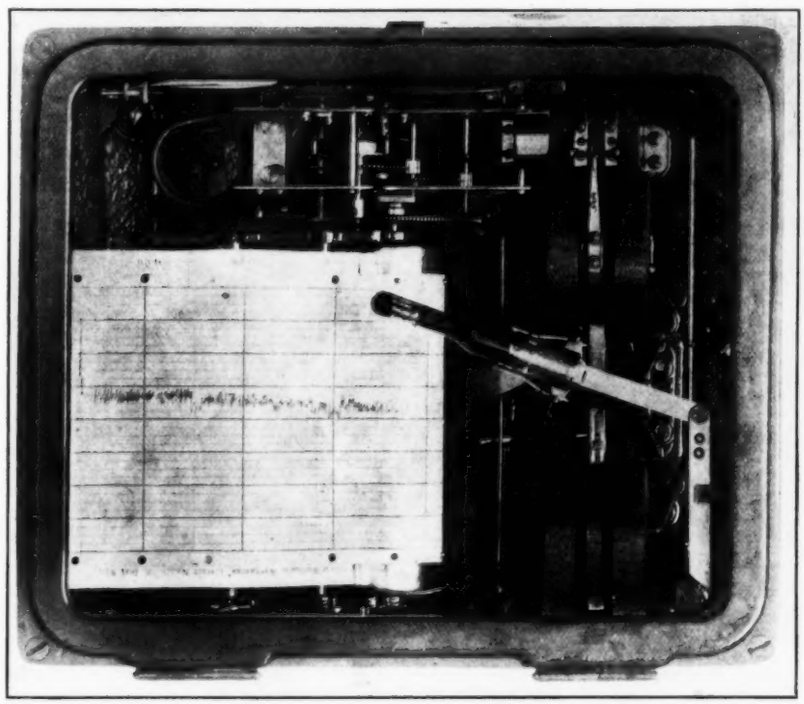
Among the interesting special applications of graphic recording electrical instruments is their use as speed recorders where some important, continued operation is to be studied with a view to improving its time, efficiency and economy. Several large New York daily papers have had installations of this kind added to their press-room equipments, and are now obtaining complete, continuous records of the operation of their mechanical plans, information which is found very valuable in foreseeing delays and halts during the hurried and important minutes when each paper is racing to be first on the streets with its editions.

Ten-volt magnets have been used in these instances, being geared or positively connected to the main shafts of the respective presses. When run at full speed, say 250 revolutions per minute, such a magneto is designed to give ten volts at its terminals. Arranged to be connected across these terminals is a 10-volt Westinghouse graphic recording voltmeter, which gives a full scale movement when ten volts is impressed upon its windings. Special record paper is furnished, reading directly in revolutions per minute up to 250 for a full scale deflection. It is evident, therefore, that when the magneto is running at full speed, 250 revolutions per minute, it develops ten volts, and this in turn produces a full scale indication, which is read directly from the scale as 250 revolutions per minute. Intermediate speeds are proportionately and accurately indicated by the meter.

At the present time, one of the best installations of this system is in the printing plant of the *New York World*, which has sixteen magnetos for recording the speeds of its single and double octuple presses. Each single octuple press is provided with one magneto, and each double press with two magnetos, as the two parts can be operated separately. At present there is installed in the *World* office, in a room two floors above the press room, a single Westinghouse graphic speed indicator arranged for connection at different times to any of the sixteen pairs of leads from the corresponding magnetos.

Each magneto has an individual complete metallic circuit to the graphic speed indicator; each circuit including a separate voltmeter resistance which has been accurately adjusted to correct the differences in the resistance of the leads, voltages of the magnetos, etc. The lengths of the various pairs of connecting wires vary from 150 to 250 feet, and the voltages of the sixteen magnetos are all within ten per cent, at the same speed. However, the accurate allowance made for each factor by inserting suitable resistance, followed by careful calibration of the indicator in circuit with each magneto, makes the meter reading absolutely dependable for the speed of any of the sixteen presses. To avoid the trouble of changing over connections, and to obtain records of several presses at the same time, each magneto is later to be furnished with its own permanent recording instrument, although this was not done at first in the case of the *World* on account of the rather novel and experimental nature of the installation.

In the case of the *World* plant, the full load speed of the press cylinders is about 200 revolutions per minute, and as the magnetos are designed to operate at a maximum of 1000 revolutions per minte, they are geared to the press cylinders at a ratio of four to one, by means of sprockets and chains. When the press is operated at a speed of 200 revolutions per minute, the magneto is running at 800 revolutions per minute, and the meter records at a point four-fifths of the distance from zero to the top of the chart.



WESTINGHOUSE GRAPHIC RECORDING VOLTMETER.

The meter clock is provided with a synchronizing attachment which is controlled from the master clock connected to the Western Union service through a special relay. The master clock is controlled by impulses at one-half minute intervals from the Western Union service, and it in turn controls a large number of clocks installed through the Pulitzer Building, in which the *World* plant is located. The relay is required to give impulses at inter-

vals of one hour for the synchronizing device.

Accompanying is the reproduction of a record recently obtained on a large press in the *New York World* plant during the printing of an edition. The record speed is four inches per hour, and the irregular line produced by the pen indicates clearly the different operations to one familiar with the action of newspaper presses. For instance, the jogs in the record, indicating a speed of about ten revolutions per minute, are caused by threading in a new roll of paper in the press, or by the repairing of a break in the paper due to a choke or excessive tension on the roll from which the paper is fed.

As the result of the success experienced with Westinghouse graphic speed

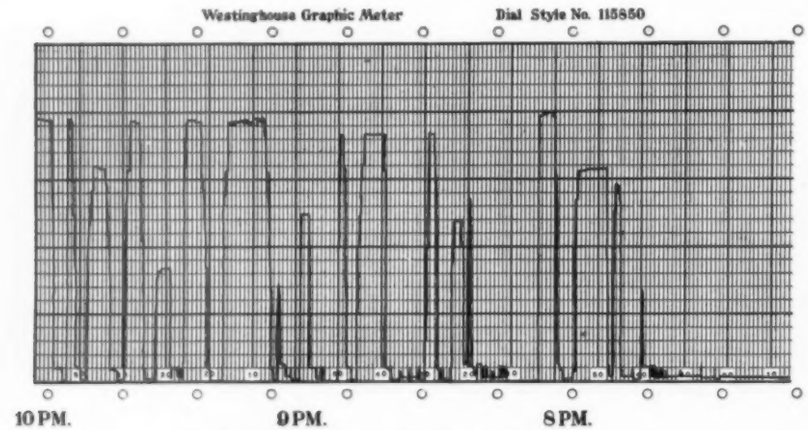



CHART FROM RECORDING VOLTMETER.

indicators in a number of printing establishments, as well as in an experimental installation in its own plant, the *New York Globe and Commercial Advertiser* is now putting in a complete system of speed recorders in its press room.

### Western Electric Optimistic for Year's Outlook.

The February returns of the Western Electric Company were sixty per cent ahead of the sales for February, 1909, and the first quarter of the company's fiscal year, ending with February, showed more than fifty per cent ahead of the corresponding quarter a year ago.

The extent of this growth is fully appreciated when it is taken into consideration that the year 1909, with its $46,000,000 gross sales, was the third largest year in the company's history and the second largest, if one does not consider the abnormal year of 1906.

In reference to the 1906 "boom" year and the chances of its repetition, an interest closely identified with the Western Electric Company, said:

"Probably the precise conditions which brought about the tremendous expansion of the 1906 period will not occur again. But that does not mean that the high record of sales for that year will never be paralleled or excelled, for in the normal growth of the telephone business the time will come when a year's gross sales of $69,000,000 will not seem large. Perhaps it is foolhardy to attempt to read the future, but I feel reasonably safe in saying that from present indications, barring, of course, such unexpected factors as crop failures or panics, 1911 will exceed the high record for 1906."

That the total of the sales for the current year will exceed $61,000,000 is the assurance of the returns for the first quarter. The sales of the company are well distributed. With the opening of the spring reason the sales to farmers, which is becoming a very important branch of the business, are commencing to show the usual large increase over the winter months.

No contracts of unusual size have been booked recently, the increase coming from abroad and steady demand.

The Western Electric has made provision through its bond and note financing for a business larger than it has ever handled before.

### Wireless for the Orkney Islands.

A recent report from England states that the British Government has given the necessary permission and guarantees for the linking up of the Okney Islands, situated to the north of Scotland, by means of wireless stations.

### Battery-Charging Rheostats.

In the rush and bustle of modern life many of the devices which contribute to our pleasure or assist us in business have features which may become a source of great annoyance, due to the difficulty of keeping them in serviceable condition. This may lead to so much delay and inconvenience that the owner will gladly avail himself of any means of avoiding this unpleasant state of affairs.

The wide application of storage batteries as a source of power for electric automobiles, launches, etc., has made it imperative that means be provided for quickly charging them and that the apparatus be so simple that the charging may be done by anyone. The owner may then charge his own battery

Wherever a 125-volt direct-current circuit is available this may be easily

BATTERY CHARGING RHEOSTAT.

accomplished without the use of expensive apparatus by the use of a General Electric battery charging rheostat, shown in the accompanying illustration. It is simple in mechanical construction, of rugged design, and has a maximum current capacity amply sufficient to meet all conditions of service.

In order to prevent any possibility of accidental contact with live parts, the rheostat is thoroughly insulated and entirely enclosed by a cover so constructed as to permit of thorough ventilation.

These rheostats are very compact, present a very neat appearance and may be installed in any place.

Before closing the main switch to charge the battery, the handle should be moved as far from the supporting feet of the rheostat as possible. After the switch has been closed the handle may be moved toward the feet of the rheostat to regulate the current.

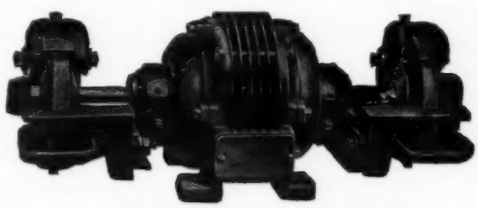
### New General Electric Alternating Current Grinding and Buffing Equipments.

In the present age of mammoth manufacturing establishments, "intensified" production, and high-paid skilled workmen, it becomes imperative that facilities be provided for utilizing both the tools and the employees' time most efficiently, in order to secure, with a given equipment, the maximum output, accompanied by the highest possible grade of workmanship. Electrically operated devices, which at once expedite the work and improve the quality of the product, are meeting with a wide application, due to the many advantages of electric control and operation.

GENERAL ELECTRIC BUFFING EQUIPMENT.

The General Electric Company's new and improved types of alternating current buffing and grinding equipments are designed for use in wood working, machine and repair shops, foundries, large manufacturing establishments, etc., where alternating current is available.

These devices find a ready application for dressing small castings, accomplishing the work much more quickly, and giving a finer finish than can be obtained with machine tool, chipping hammer, chisel, etc.



GENERAL ELECTRIC GRINDING EQUIPMENT.

The General Electric grinding equipment consists of an alternating current motor with substantial supports fitted with tool rest and water attachment; these latter accessories being rigidly clamped to the bearing brackets in such manner as to permit ready removal when desired.

Each end of the extended shaft is fitted with two steel flanges, two leather washers, and one nut for clamping the emery wheel securely in position. The motors are rendered splash and dust-proof by totally enclosing them; while shafts, bearings, attachments, and all working parts are made extra strong and durable to withstand hard and constant usage.

The installation of a grinding equipment where it is readily accessible to the shop force, enables the men to always keep tools sharp, thereby saving time, greatly increasing output, and improving the quality of the finished product. As sharp tools require much less power than dull ones, the cost of power may be sensibly diminished by keeping all cutting edges in the best condition. Workmen using dull tools are apt to become careless and eventually turn out inferior work, resulting, especially where competition is keen, in loss of the shop's prestige and patronage.

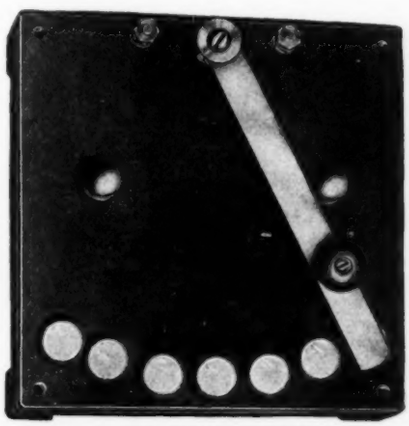
The self-contained buffing equipments are compact and rugged and provide a very effective polishing device, the use of which invariably results in a great saving of time and labor. These devices are similar in construction to the grinding outfits, with the exception that tool and water attachments are omitted. The shaft is also longer, each end being tapered and threaded for receiving the buffs. The bearing brackets are circular and so designed that they may be turned through ninety degrees to admit of side-wall installation, thus allowing relocation of the device at will.

The following equipments are supplied for operation on single, two or three-phase, 110-220-volt circuits: Single-phase, three-eighths, one, two and three horsepower, and polyhase, three-eighths, one, two, three, five and seven and one-half horsepower.

### A New Small Rheostat.

The wide application of electricity to the driving of small motors for sewing machines, ice cream freezers, fans, etc., and to heating glue pots, flat irons and other small heating devices has led to a demand for a substantial and reliable small rheostat. This need has been met quite satisfactorily by the General Electric Company's compact, reliable, C R 175 rheostat. It is designed for installation on 115 and 230 volt direct current circuits.

Seven contact points admit a comparatively wide variation in resistance and their liberal spacing removes any possibility of dust or dirt accumulating and short-circuiting a portion of the resistance.



NEW G. E. SMALL RHEOSTAT.

### Wood Turning for Electrical Apparatus.

Electrical contractors and manufacturers should be interested in the announcement that Clemens, Ehnborn and Company, Forty-third Court and Wabansia Avenue, Chicago, Ill., are specializing in wood turnings for electrical apparatus.

The completely equipped plant of Clemens, Ehnborn and Company, together with good shipping facilities insures immediate attention and prompt shipment of all orders without regard to size.

Among the work receiving especial attention may be mentioned, handles, rollers, plugs, spools and bobbins and all classes of mechanical woodwork.

**Electric Drive in a Lumber Mill.**

Under the above caption there appeared in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of March 5 last, on pp. 471, 472 and 473, an illustrated article describing the electrically-operated plant of the Franklin County Lumber Company, in Greenfield, Mass. The following table gives a list of the machines used in this factory, together with the names of the manufacturers and some details of the motor drives. The electric motors, it may be mentioned, were supplied by the Westinghouse Electric and Manufacturing Company.

| Machine. | Manufacturer. | Size (inches). | Revolutions per minute of machine. | Location of motor and method of connection. | Revolutions per minute of motor. | Horsepower. | Type of motor. |
|---|---|---|---|---|---|---|---|
| Double blower | Sterling Blower and Pipe Manufacturing Company. | 30 | 1120 | On platform suspended from ceiling, direct-connected. | 1120 | 30 | Squirrel cage. |
| Four-head inside molder. | C. B. Rogers. | 13 | 800 | Ceiling, belted. | 1700 | 30 | Wound Secondary |
| Rotary-bed planer. | Chase. | 24 | 3000 | Ceiling below with countershaft below, two belts through floor. | 1700 | 20 | Squirrel cage. |
| Matcher. | Witherby, Rug & Richardson. | 24 by 25 | .... | Ceiling above, belted. | 1120 | 20 | Wound Secondary |
| Four-head molder. | Houston. | 10 | 800 | Ceiling above, belted to counter. | 1700 | 15 | Wound Secondary |
| Re-saw. | John A. White. | 48 by 25 | 400 | Wall, belted. | 1120 | 10 | Squirrel cage. |
| Double-drum sander. | W. A. Heath Machine Co. | 30 | 800 | Ceiling below, with counter below, two belts through floor. | 1700 | 7.5 | Squirrel cage. |
| Baling press. | Dederick and Sons. | .. | .... | Ceiling, belted to counter on ceiling. | 1700 | 7.5 | Squirrel cage. |
| Jointer. | C. B. Rogers. | 20 | 4650 | Floor, motor and belt boxed. | 1700 | 5 | Squirrel cage. |
| Saw bench. | Frank Clements. | 14 | 3000 | Wall, belted. | 1700 | 5 | Squirrel cage. |
| Molding sander. | Austin & Eddy. | 8 | 200 | Ceiling, belted to floor counter. | 1700 | 5 | Squirrel cage. |
| Single-spindle shaper. | Homemade. | .. | 3000 | Vertical motor belted to vertical counter. | 1700 | 5 | Squirrel cage. |
| Single-head sash sticker. | Rowley & Hermance. | 4 | 800 | Wall, belted to counter. | 1700 | 5 | Squirrel cage. |
| Swing saw. | American Woodworking Machinery Company. | 16 | 2000 | Ceiling, belted to ceiling counter. | 1700 | 5 | Squirrel cage. |
| Twin cut-off saw. | C. B. Rogers. | 16 | 2200 | Ceiling below belted through floor. | 1700 | 5 | Squirrel cage. |
| Pony planer. | H. B. Smith. | 24 | 3800 | Wall, belted. | 1700 | 5 | Squirrel cage. |
| Combination hand-feed saw bench, iron table. | C. B. Rogers. | 20 | 2500 | Floor, motor and belt boxed. | 1700 | 5 | Squirrel cage. |
| Edger hand feed. | Homemade. | 24 | 2500 | Floor, motor and belt boxed. | 1700 | 5 | Squirrel cage. |
| Group of tenoner, mortiser, vertical boring machine. | H. B. Smith<br>H. B. Smith<br>Homemade. | ..<br>..<br>.. | 800<br>450<br>420 | Wall, belted to ceiling countershaft. | 1700 | 5 | Squirrel cage. |
| Group of emery wheel, knife grinder. | Union Stone Co. | 8 by 1.5 by 26 | 800<br>250 | Ceiling to counter on ceiling. | 1706 | 5 | Squirrel cage. |
| Window-frame machine. | Smith-Philips | .. | 835 | Wall, belted to floor counter. | 1700 | 3 | Squirrel cage. |
| Hand-feed cut-off saw. | C. B. Rogers. | 16 | 2600 | Wall, belted. | 1700 | 3 | Squirrel cage. |
| Tilting saw bench, wood table. | Rogers. | 16 | 2500 | Floor, belt and motor boxed. | 1700 | 3 | Squirrel cage. |
| Band saw. | Baxter. | 36 by 0.25 | 300 | Ceiling below, belted through floor. | 1700 | 3 | Squirrel cage. |
| Jointer. | Baxter. | 16 | 4000 | Floor, belt and motor boxed. | 1700 | 3 | Squirrel cage. |
| Variety lathe. | Mattison. | .. | 3400 | Floor, belt and motor boxed. | 1700 | 3 | Squirrel cage. |
| Kindling cut-off saw and conveyor. | W. A. Heath Machine Company. | .. | 500 | Ceiling, belted to counter. | 1700 | 3 | Squirrel cage. |
| Column sander. | | 9 (disk) | 660 | Vertical, coupled to vertical spindle. | 1700 | 2 | Squirrel cage. |
| Lathe. | | .. | 600 | Wall, belted to ceiling counter. | 1700 | 2 | Squirrel cage. |
| Jigsaw. | Eureka. | .. | 550 | Below table of saw, belted to crankshaft counter. | 1700 | 1 | Squirrel cage. |

**New Equipment for the Cuyahoga Telephone Company.**

J. C. Murray, sales manager, and R. W. Pillars, state representative of the Kellogg Switchboard and Supply Company, announce the closing of a contract with the Cuyahoga Telephone Company, of Cleveland, Ohio, for a four-section full common battery multiple switchboard, with lamp signals and double supervision on all cords; one main distributing frame and one intermediate distributing frame and relay rack.

The switchboard will be of standard quality mahogany. All current except that used for ringing subscribers will be furnished by one battery plant located at the central office. The multiple and answering jacks will be of what is known as the branch terminal, two-wire, bridging type and having no series or third-wire contacts in the jacks. The line-talking circuits will be strictly metallic. The four-party frequency system will be non-interfering and will operate on a metallic line without the use of a ground or a third wire.

Four sections of Kellogg standard, three-position, eight-panel multiple switchboard will be provided. Each section will be arranged for an ultimate capacity of 4,800 subscribers' jacks, 320 outgoing trunk multiple jacks and 640 answering jacks and lamps. The system will be arranged for an ultimate capacity of 3,200, with the present equipment of 720 subscribers' common battery lines. The Kellogg main distributing frame will have a present capacity of 960 subscribers' common battery and trunk lines. The intermediate Kellogg distributing frame will have a present capacity of 720 subscribers' lines and 120 miscellaneous lines. The relay rack will have a present framework for 720 line and cut-off relays. The cable rack, power equipment and general installation will be of the latest type and complete, to furnish the very best service.

**Gas-Driven Generator Sets in a Brickmaking Plant.**

For supplying power to the brickmaking machines in its new brick plant at Carlyle, Kan., the Lumbermen's Portland Cement Company has installed two Westinghouse vertical gas engines of 200 and 140 horsepower capacity respectively. These engines use as fuel natural gas from the company's wells. Direct-connected to the gas engines are a 150 and a 100-kilowatt Westinghouse alternating-current generator, which furnish three-phase, twenty-five-cycle power at 440 volts for the motor-driven brickmaking machinery.

# Current Electrical News

## GREAT BRITAIN.

*(Special Correspondence)*

LONDON, MARCH 18.—Although reductions in the price of metal filament lamps are being made by all continental makers, only a few British makers have as yet adopted a similar policy. There are signs, indeed, that steps will be taken here to prevent such a policy becoming common. A meeting of lamp makers is to be held in London to discuss the matter. Naturally, the factors are on the side of those manufacturers who are against undue price cutting. An interesting announcement has just been made that the firm of Siemens will shortly place on the market a drawn tungsten filament lamp, having a consumption of one watt per candle. It is to be called the "one-watt" lamp.

The Belfast corporation has been recommended by its electrical engineer to place an order for a continuous current turbo-generator for traction purposes with an output of 1,500 kilowatts. This will be the largest single direct current turbine set installed in Great Britain, as the previous practice has been to install tandem dynamos for dealing with such an output on direct current. Two similar sets of 1,200 kilowatts capacity are on order for the Admiralty dockyard at Devonport.

At a meeting of the Illuminating Engineering Society this week, Prof. J. A. Fleming, F. R. S., made a strong plea in favor of an international standard unit of light, with platinum for preference. Recent improvement in electric induction furnaces, he said, had removed many of the difficulties which previously stood in the way. During a debate of methods of photometry, Mr. A. P. Trotter, electrical adviser to the Board of Trade, said that the equipment of many of our technical colleges in relation to photometry was 20, 30 and 40 years old, and that from an educational point of view, photometry was lamentably treated, especially in respect to physics as a branch of photometry.

In the midst of all the arguments in favor of a contract system of charging small consumers for electric supply, i. e., an inclusive fixed charge per lamp per week, month or quarter, with no limit upon the consumption, an announcement from Dundee is of interest. Here such a system has been tried experimentally for a short time, but has proved to be unsatisfactory presumably to the supply authority. The city electrical engineer thinks that both sides will be more equitably treated by a reversion to a meter.

A new submarine cable is to be laid between England and France, and it will be noteworthy for the reason that it is fitted with "loading" coils. It is hoped by the aid of the cable to extend direct telephonic communication between Paris and England as fas as the northern cities. G.

## EASTERN CANADA.

*(Special Correspondence.)*

OTTAWA, ONT., MARCH 26.—Application has been made to the legislature of Quebec for the incorporation of the Montreal Underground and Elevated Railway Company, with a capitalization of $20,000,000, to operate an underground and elevated railway system in the city of Montreal.

The Montreal Street Railway is asking authority from the Quebec legislature to construct a subway, at an estimated cost of $1,500,000, below the most heavily traveled and narrowest portion of St. James street in Montreal, in order to take off a part of the surface traffic.

The long-expected electrical power has arrived at the Cobalt mining camps. The full load at 44,000 volts was passed, a few days ago, over the transmission lines from the Matabitchouan River to the Brady Cobalt sub-stations. This is one of the several concerns establishing power plants in the district.

A petition has been introduced into the Quebec legislature for the incorporation of the Soulanges Power Company, with a capitalization of $1,000,000, to develop and sell electric power in the counties of Soulanges, Jacques Cartier, Laval and Hochelaga, and in the city of Montreal, and to construct the transmission lines.

One of the electric power companies operating in the Cobalt district, the Cobalt Power Company, has now the advantage of a short transmission line. A dam has been built at Hounds Chutes, on the Montreal River, six miles from Cobalt. The effective water head is thirty-five feet, and the plant will be capable of developing 4,000 horsepower through four units.

Twelve car loads of electric equipment have been installed recently in the city's power station, at Toronto, and it could be completed by the end of May next. The city has only recently secured the right of way within its limits for the power line, however, and it will probably be September before it will be in a position to take power from the hydroelectric commission. A number of other towns and cities will be operating their municipal utilities within another month.

The Cedar Rapds Manufacturing and Power Company is asking the provincial government of Quebec to cede the company all titles the government possesses on that part of the bed of the St. Lawrence River, which runs along the lands owned by the company. The lands asked for by the company cover an area of 195 arpents, and the ownership of them would enable the company to develop 100,000 horsepower.

If the bill of the St. Lawrence Power Transmission Company passes the Canadian parliament, as it probably will, unless the opposition succeeds in blocking its passage for the present session, the proceedings in respect to the plans for damming the Long Sault will be dropped, the company falling back on the authoritative legislation of 1901. The company already has power to dam the river, but the dam would not avail much unless there is provision for transmitting electric energy as it is developed, and the company has no such authority at present. It is claimed that the promoters of the transmission bill can well afford to agree not to export power from Canada to the United States. What power is developed on the Canadian side will be handled under the provisions of the bill, but the parliament of Canada can place no restriction on the power that is developed on the American side. The bill will come up again for consideration after the Easter adjournment and its opponents are prepared to fight it to the last ditch, and will even resort to deliberate obstruction to prevent it becoming law. W.

## CONTINENTAL EUROPE.

*(Special Correspondence.)*

PARIS, MARCH 18.—Among the hydraulic plants which are in course of erection on the continent, I note the Andelsbach station, which will rank among the large electric plants of Austria. It is now building and is located in the Bregenz Wald region. An extensive network of power lines will radiate from the station and will supply the surrounding territory. The units in this case are 2,500 horsepower turbine—alternator groups, and the Siemens-Schuckert Company of Vienna secured the contract for furnishing these. A part of the apparatus, however, and especially the switchboard installation is to be furnished by the Oerlikon Company, of Switzerland. Current will be delivered by these groups at 5,200 volts and fifty cycles, and this will be raised by transformers so as to operate the power line at 25,000 volts. The three-phase system will be used exclusively in the present plant.

In Germany, the town of Rathenow is taking measures to install an electric tramway line, and it will be used for passenger and freight service. There will be built an electric traction line in Austria from Kamaraerdo to the town of Torokbalint. These localities lie in the region of Budapest. In France, there is a project on foot for an electric railroad which will run from Mure to Gap. Another project is a tramway line to be built between Pont l'Eveque and Mezidon, in the north of France.

The Municipal Council of Paris is engaged in reorganizing the traction service of the city, seeing that the concesson of the General Tracton Company is to expire on the 30th of May. The new arrangements which are being made will affect a large number of electric tramway lines running in the city and suburbs, so that the electrical interests are largely engaged in the question.

A. DE C.

## IMPORTANT DEVELOPMENTS.

*(Special Correspondence)*

NEW POWER HOUSE ON THE CHATTAHOOCHEE.—The Columbus Power Company of which J. S. Bleecker is general manager, will erect a dam and power house on the Chattahoochee River at Goat Rock, twelve and a half miles north of Columbus, Ga. The dam will be seventy feet high and 800 feet long. Twenty-four thousand horsepower will be the ultimate development at that point, although all the power may not be used for the present. The dam and power house combined will represent an investment of $1,500,000. A railroad will be built from Motts, Ala., on the Central of Georgia R. R. line to the site of the dam for the purpose of hauling machinery and building material. B. H. Hardaway of Columbus, Ga., has the contract for building the line, which will be about seven miles long. The machinery used in the construction work will be electrically operated and a transmission line is to be built from Columbus to the scene for the purpose of conveying power there. The power to be generated at this new dam will be electrically transmitted to Columbus, West Point, Ga., and Opelika, Ala., for the use of industries in those places. This will be the Columbus Power Company's fourth plant. B.

## LIGHTING AND POWER.

*(Special Correspondence.)*

ELK CITY, OKLA.—The city will expend $40,000 in extensions to its electric plant. P.

LIDGERWOOD, N. D.—W. R. Nevius has applied for an electric light franchise here. P.

MOUNTAIN VIEW, OKLA.—This city will put in an electric light plant to cost about $20,000 P.

FAIRVIEW, KAS.—This city has voted bonds for the construction of an electric light plant. P.

GRAND FORKS, N. D.—Bonds to the amount of $25,000 have been voted for an electric light plant.

SAVANNAH, MO.—F. C. Barrington has applied for a franchise to establish an electric light system. P.

ELGIN, TEX.—The Elgin Light and Power Company has been incorporated with a capital of $15,000. P.

MILE CITY, MONT.—The council resolved to enlarge and improve the equipment of the electric light plant. C.

ALLERTON, IOWA.—It has been voted to issue bonds for the installation of an electric light plant, to cost $12,000. C.

SILVER CITY, N. M.—The Gila River Power Company has been incorporated with a capital stock of $6,000,000. P.

POSTVILLE, IA.—The Postville Light and Heat Company has been incorporated with a capital stock of $25,000. P.

ALLERTON, IA.—The city has voted bonds for the construction of a $12,000 municipal electric lighting plant.

MARENGO, IA.—The Marengo Electric Light and Power Company has been incorporated with a capital stock of $15,000. P.

OWATONNA, MINN.—Bonds for $50,000 for the installation of a municipal electric light and power plant have been voted. C.

EUREKA SPRINGS, ARK.—The Eureka Springs Electric Company has been incorporated with a capital stock of $100,000. P.

RAPID CITY, S. D.—A franchise has been granted to the Rapid City Electric and Gas Light Company to install an electric light plant. C.

LA FAYETTE, ALA.—This town voted $40,000 of bonds with which to enlarge lighting plant, install waterworks and a sewerage system. B.

GADSDEN, ALA.—It is proposed to build a new electric power plant here. In addition to lighting, power will be supplied to manufacturing plants.

DALTON, GA.—This city will vote on the issuance of $20,000 of electric light bonds and Paul B. Trammel, the Mayor, will give any information desired. B.

HUOT, MINN.—Work has been commenced on the plant of the Crookston Water Works, Power and Light Company, which will develop 3,500 horsepower. C.

UNIVERSITY PLACE, NEBR.—This city will install an electrically-driven deep-well pump. Water is to be supplied from a ten-inch well, 160 feet in depth.

MENTOM FALLS, N. Y.—At a recent election the bid of the Elmira Water, Light and Railroad Company for lighting the city was accepted by popular vote.

GRIDLEY, CAL.—An election for $17,500 worth of bonds has been called, the proceeds to be used for the acquisition of an electric light and power plant.

REDWOOD CITY, CAL.—Benjamin Cunha has been granted a franchise for the purpose of transmitting and distributing electricity for illuminating purposes.

ALBERTON, MONT.—Permission has been granted by the county commissioners to lay mains, erect poles, etc., for an electric light and power line for this city.

PEARSALL, TEXAS.—The Pearsall Ice and Light Company has been incorporated with a capital of $50,000, by George F. Hinder, J. J. Little, John T. Bivens and others.

BIRCHWOOD, WIS.—The Wisconsin Light and Power Company is arranging to replace its wooden dam with a concrete structure, four feet higher than the old one. C.

NEW BRIGHTON, PA.—The Valley Electric Company has been sold to VanHorn Ely, of Steubenville, O., president of the East Liverpool Traction and Light Company.

EDICON, GA.—J. B. McCrary Company, Empire Building, Atlanta, will prepare plans for and construct an $8,000 electric light plant for this city. C. J. Jenkins is the Mayor. B.

RAPID CITY, S. D.—The Missouri Valley Engineering Company of Vermilion, S. D., secured the contract for the engineering work on the hydroelectric plant, estimated to cost $249,000. C.

FAULKNER, TENN.—The Faulkner Light and Power Company has been incorporated with a capital of $10,000 by T. B. Johnson, G. W. Killebrew, Johnson Bransford, A. H. Robinson and Robert Lusk.

DALTON, GA.—The town will vote shortly on a $125,000 bond issue proposition, of which sum $20,000 is to be used for improvements and extensions to the municipal electric lighting plant, and the remainder for various municipal improvements and expenditures. L.

SYLACAGUA, ALA.—The city has acquired the power at McEwen's mill site on Hatchett Creek. It will be developed electrically, supplying power for lighting the town and operating industries there. B.

NORFOLK, W. VA.—The new plant of the Old Dominion Table Works, which is being built, will be driven throughout by electricity. Power is to be supplied by the Norfolk and Portsmouth Traction Company.

WAYCROSS, GA.—The Ware County Light and Power Company, has been incorporated with $100,000 capital stock, by C. S. Hammatt, R. G. Lewis, Leon A. Wilson, W. W. Lambdim and John W. Bennett. B.

GRAND FORKS, N. D.—The contract for the installation of a boiler, engine, dynamo, mechanical stoker, and other equipment at the electric lighting plant was let to J. G. Robertson, St. Paul, Minn., for $14,900.

MARSHALLVILLE, GA.—The Alberta Crate Company, under the direction of J. M. Simmons, Samuel H. Rumph, will soon proceed with the erection of seventy-saw ginnery, electric light plant and water works system. B.

FARMVILLE, N. C.—The board of aldermen has been instructed by a citizens' mass meeting to proceed at once with the construction of an electric lighting plant for the town. A site has been secured for the new plant. L.

RICHARDTON, N. D.—Richardton is to be lighted by electricity. The current is to be supplied from St. Mary's College and Abby and the wires will be strung on the telephone company's poles. Four hundred lights have been signed for.

GLENS FALLS, N. Y.—The Mills Power Company of Glens Falls has been incorporated with a capital of $50,000, and these directors: James H. Cross, of Johnstown; Theodore D. Cross, of Sandy Hill, and J. Ward Russell, of Glens Falls.

MONTPELIER, VT.—Corporation papers have been filed by the Cavendish Electric Light Company, formed to generate heat, light, etc., with a capital of $5,000, the subscribers being J. E. Gay, Olin D. Gay, Lon S. Gay, Mertie A. Gay, Floyd S. Gay, of Cavendish.

WARWICK, GA.—The Flint River Power Company, has been incorporated with $1,000,000 capital stock, to undertake hydroelectric development at this point. The incorporators are: D. G. Ziegler, Jacksonville, Fla.; E. W. Fenn, Worth County, Ga.; and John Burck, Lee County, Georgia. B.

ANNISTON, ALA.—The Alabama Power Development Company, of which R. L. Rand, of Anniston, is general manager, is reported as preparing to proceed with its plans to develop water power and transmit it electrically to Anniston and Talladega. This company has established an office in Talladega. B.

MERIDIAN, MISS.—The Consolidated Gas and Electric Company of New York will, it is reported, secure an interest in the Meridian Light and Power Company, whose holdings here are valued at about $1,000,000. The present stockholders will retain their holdings, while the stock will be increased.

JEFFERSON, WIS.—A special election will be held in Jefferson April 8 to decide whether the town will purchase the interest held by the David Johnson estate in the local water power. The Johnson estate has offered to sell its share for $10,000 to the city. A three-eighths interest is already owned. M.

PORTSMOUTH, N. H.—The construction department of the Rockingham County Light and Power Company has arranged with the Boston & Maine Railroad for the setting of nineteen poles on the Portsmouth and Kittery bridge to carry the necessary feed lines from this city to light the town of Kittery and the bridge.

AMHERST, MASS.—Work is soon to be started on a big scale in building the electric power line from Amherst to Easthamton for the Amherst and Easthamton Power Company. Electricity from Amherst will be sold to the West Boylston mill in Easthamton as well as to other prospective customers, and used for power.

SANTILLO, MEX.—A power plant to supply 15,000 horsepower will be erected by the Monterey Hydroelectric Company on the Pilon River in northern Mexico. This plant will supply electric power to a number of industries in the neighborhood and its is probable that a line will be run to Monterey, a distance of forty-eight miles.

COLUMBUS, OHIO.—The Columbus Railway and Light Company is rapidly outgrowing its present generating capacity and to provide for present and future needs it is about to install a steam turbo generator. Contract for this machine has been awarded to Allis-Chalmers company. It is a 4,000-kilowatt, 4,150-volt, three-phase unit.

RICHMOND, VA.—Citizens of Highland Park, constituting the Highland Park Citizens' Committee, are endeavoring to procure electric lighting facilities for that suburb, and a committee has been in conference with the committees on lights and on finance, and it is expected that the suburban town will soon build a municipal lighting plant. L.

PACHUCA, MEXICO.—The Mexican Light and Power Company is constructing an electric transmission line to the Pachuca mining

district and expects to be furnishing power to the mining companies with which it has contracts by the middle of July. It has just finished taking over the properties of the Hydroelectric and Irrigation Company of Hidalgo. D.

FLORENCE, S. C.—United States Judge J. C. Pritchard has granted a decree in the case of the Real Estate Trust Company, of Philadelphia, against the Florence Light and Power Company, and has ordered a sale of the property of the electric company, including everything, on a date to be named later. Receiver P. A. Willcox will conduct the sale. L.

TOLEDO, OHIO.—The little town of North Lewisburg, Ohio, is in total darkness because patrons of the local lighting plant would not pay their bills. The owner of the plant, John Conklin, shut it down, announcing that he was unable to buy coal and pay help on promises. The municipality also lacked funds to pay for its street lights since the county was voted dry. H.

NORTH YAKIMA, WASH.—The Natches Light and Power Company states that it is a small local water company, supplying domestic water to the town of Natches, and as it is not in the light business it does not use nor contemplate using machinery of any kind. It therefore requests that its name be removed from the mailing list of electrical manufacturing companies.

MUSCATINE, IA.—The Citizens Railway and Light Company has recently added a 750-kilowatt Westinghouse turbo-generator set for its local light, power and railway service. A rotary converter set makes available direct current for the latter purposes. The condensing system is of the Leblanc jet type, manufactured by the Westinghouse Machine Company, East Pittsburg, Pa.

TUSCALOOSA, ALA.—The city council has decided to buy the electric light plant, exercising the option given the city by the terms of the franchise of the present local company. The purchase price will be determined by appraisers, one of whom will be selected by each party, the third to be chosen by those two. A bond issue will be necessary to make this purchase. The Mayor can give information. B.

PITTSBURG. PA.—The management of the Pennsylvania Lines West of Pittsburg has placed an order with Allis-Chalmers company for electric generating units to increase the capacity of the power plant at Conway, Pa., from which current for operating the shops there, and also for railway signal work, is supplied. The new machinery consists of two 750-kilowatt, sixty-cycle, three-phase steam turbo units.

HERMOSILLO, MEXICO.—It is announced that the Mayo River Power and Land Company has finished the surveys for the first of the series of three dams and hydroelectric plants that it will erect on the Mayo River in the eastern part of the state of Sonora and that it is expected that everything will be in readiness for the commencement of construction work by the close of the coming rainy season in September next. D.

MERIDIAN, MISS.—Henry L. Doherty & Company, of New York, are reported to have become the owners of the Meridian gas, electric and traction properties, the price paid not being given, but it is understood that the sum of $300,000 will be expended without delay in improvements and extensions to the system. The company is interested in the municipal properties of Knoxville, Memphis and other cities of the South. L.

SEYMOUR, IND.—The new improvements and extensions for the Seymour Gas and Electric Company's new plant are well under way. A new boiler, Corliss engine and two and three-phase, 2,300-volt, sixty-cycle generators are being installed. The entire pole line is to be rebuilt. Two miles of gas mains are to be put in. The franchise asked for the new company by Frank R. Grover, W. C. Bevins and E. J. Condon, who is doing the engineering and construction work, has already passed first reading.

ALBANY, GA.—The Albany Power and Manufacturing Company, Louis F. Joerissen, Atlanta, Ga., president, and general manager, will build a steam auxiliary plant of 1,000 horsepower capacity, at cost of about $50,000. This company now has a hydroelectric plant on Muckafoonee Creek. J. E. Sirrine, Greenville, S. C., is a member of this company's board of directors, and is its chief engineer. It is understood that Mr. Sirrine will prepare the plans for the new plant and have charge of the construction. B.

RICHFIELD, U.—The Belknap Power Company was reorganized at a recent meeting. The resignations of N. C. Clawson and James Long as directors were accepted, and W. H. Seegmiller and William Johnson were elected. The officers of the company are: W. H. Seegmiller, president; J. C. Wright, vice-president; M. L. Weimer, secretary; William Johnson, treasurer; J. B. Weimer, manager. The company has a small force of men at work on the approach to the proposed tunnel, and manager Weimer expects to go east in a few days and assist A. C. Steele of St. Paul in the financing of the proposition.

CHARLOTTE, N. C.—Competition in both private electric lighting and in gas lighting is assured for this place, through the application of the recently chartered Charlotte Power Company for a local franchise to sell electricity for lighting and for power, and also to sell gas. This company is backed by the Southern Power Company, and will come in direct competition with the 4 C's Company, or the allied Charlotte Gas and Electric Company, of which E. D. Latta is president. The city council in the meantime has showed signs of balking at the application for a free franchise, the settlement of the issue being expected early in April. The Charlotte Power Company is a strong corporation, backed by ample funds. L.

DEFIANCE, OHIO.—The first step toward the proposed new electric lighting and water plant for this city was taken recently when the council authorized the board of control to enter into a contract with an engineering firm to prepare preliminary plans and estimates for a joint light and water plant at an estimated cost of $200,000. The franchise of the Defiance Gas and Electric Company has expired and it has been unable to agree with the council upon terms for a new franchise, the company claiming that the rates offered by the city are impossible. The water company claims to still own seven years of a thirty-year franchise, but the city claims that the council that granted the right could not go beyond twenty years, and that the company no longer has any valid right. Public sentiment is strong in favor of municipal ownership, and the heavy bonded indebtedness of the city is the greatest obstacle in the way. H.

ST. LOUIS, MO.—The Light and Development Company, which is seeking a franchise to become a competitor of the Union Electric Light and Power Company, has formulated its plans for the investment of more than $2,000,000 in plant and equipment. A bill, covering all the points in the regulation of public service corporations, was introduced in the House of Delegates, and will be offered the company. If the company is given the grant, it is the intention of the officers to furnish electric current to St. Louis for twenty per cent less than the rates of the Union Electric Company. Thus the price of electricity to the ordinary householder would be ten cents per kilowatt hour. The Union charges twelve cents. Mr. Wurdack said the price will be cut still more after the company had gained a solid footing. The company under the terms of the franchise will be compelled to equip a plant of at least 4,000 kilowatt capacity, but Mr. Wurdack says they expect to be able to furnish much more power after they get in running order.

## ELECTRIC RAILWAYS.

*(Special Correspondence.)*

WINNEPEG, CAN.—Regina Manitoba is to have a street railway service. Inquiries should be addressed to Mayor Williams of that city. R.

SUISUN, CAL.—The Vallejo and Northern Railroad Company has been granted a franchise for an electric street-railroad in this town. A.

SACRAMENTO, CAL.—The Northern Electric Railroad Company is about to build a branch line from a point a little west of Beni Ali into Fairoaks.

SANTA BARBARA, CAL.—The Santa Barbara Consolidated Company has been granted a twenty-five year franchise for an electric railway in this city. A.

FARIBAULT, MINN.—It is rumored that the electric power company at Mankato, Minn., is considering the construction of a trolley line to Cannon Falls, Minn. C.

PRESQUE ISLE, ME.—The Aroostook Valley Electric Railroad Company has completed its bridge across the Aroostook River and its substation at Munson Hill. It is expected that the line will be opened early in the spring.

VIDALIA, GA.—An electric line is to be built from this place to Geltic Spring, a distance of eight miles. Power for the road will be secured from the Penhoopee River. Messrs. Power and Sneed are promoting the project.

LOGANSPORT, IND.—J. Levering Jones, president of the Ft. Wayne & Wabash Traction Company, has closed a deal for a site in this city on which to build a modern interurban station. The company will expend $50,000. S.

PERU, IND.—Benjamin E. Wallace has submitted a proposition to build a new joint passenger and freight station here for the three interurban roads and give them a low rental. The companies have the matter under advisement. S.

SAN FRANCISCO, CAL.—The Public Utilities Committee has given the United Railroads a time extension until April 30, to install new fenders on company's cars. The committee insists upon the use of the large projecting "Eclipse" type of fender. A.

OAKLAND, CAL.—A twenty minute car service has been installed between Oakland and Point Richmond, both by the Oakland Traction Company and the East Shore and Suburban Railway of Richmond. The cars will run to Seventh and Broadway, Oakland.

LOS ANGELES, CAL.—Edwards and Wildey have been granted a twenty one year franchise for a double-track electric street-railway commencing at the intersection of Heliotrope and Melrose Avenue, westerly along Melrose Avenue to Normandie Street. A.

FT. WAYNE, IND.—Grading for the new Ft. Wayne-Bryan electric line has been begun at three separate points and the work will be pushed to speedy completion. This will afford a direct line from Ft. Wayne to Toledo and make the sixth interurban road for Ft. Wayne. S.

EAU CLAIRE, WIS.—The Chippewa Valley Railway, Light and Power Company let the contracts for the installation of electrical machinery and water wheels at the Red Cedar dam and power house to the General Electric Company and the Allis-Chalmers Company, of Milwaukee, respectively. C.

GREENVILLE, TEXAS.—The Eastern Texas Traction Company of this city has been incorporated with a capital of $12,000 by J. H. Blocker, J. B. Murphy, H. E. Vaughan, W. M. McBride, H. C. Tittsworth, Glen A. Coulson, J. Riley Green and others. The line is to run between Greenville and Wolf City.

INDEPENDENCE, KAN.—D. H. Higgins, who now has his interurban system operating cars on a regular schedule between this city and Cherryvale, will apply for a franchise for a city system at once, he announces. It is also probable that his line will be pushed on to Columbus and join with the Heim network of trolleys.

KINGMAN, IND.—Three miles of the Kingman interurban road have been completed. Work on the grading as far west as Wallace is progressing rapidly. The officials have received the way-bills of another shipment of steel which is on its way. The company is now operating one car over the completed portion of the interurban road. S.

FT. WAYNE, IND.—The trolley lines out of this city are to be used extensively by the business men of Ft. Wayne to boom the city and especially the business of the merchants, manufacturers and jobbers. The plan is to run special excursion trains over the six systems equipped with all sorts of publicity devices and information to bring trade to Ft. Wayne. S.

EVANSVILLE, IND.—The Evansville and Southern Indiana Traction Company has promised the city officials that it will expend $65,000 during the present year on improvements on its local traction lines. Vice-president Marshall and superintendent Durbin say their purpose is to so improve the system as to afford a service as good as rendered anywhere under like conditions. S.

SANDUSKY, OHIO.—The Lake Shore Electric Railway in an effort to secure a franchise to lay its tracks across the new Huron River bridge at Huron, Ohio, has offered to pay the county commissioners the sum of $12,000 for the privilege for twenty-five years, the money to be paid at the expiration of the period. The commissioners have taken the matter under advisement. H.

SAN FRANCISCO, CAL.—Rights of way for the new electric street railway, which is an extension of the Mission-street line to Visitacion valley, have been conveyed by the owners of the lands lying along the boundary lines between San Francisco and San Mateo counties to the San Francisco Electric Railways. The deeds, which were executed last August, were recorded only a short time ago.

WABASH, IND.—J. A. Barry has returned from New York with the announcement that a strongly financed construction company has agreed to take the contract for the construction of the Wabash-Warsaw interurban road off the hands of the Miami Construction Company. Mr. Barry says the construction of the road will not be delayed any longer and that actual grade work will be begun soon. S.

GREENSBURG, PA.—Officials of the West Penn Railways Company have announced that plans are completed for the building of a branch line from Greensburg to Jamison coke works, and thence to Latrobe, a distance of ten miles. The West Newton & Hunter line will be built during the coming summer. Nearly all the rights of way have been secured. The line will be twenty miles long and will pass through the Yukon valley.

ORTIZ, STATE OF CHIHUAHUA, MEXICO.—Colonel Antonio Ramos Cadena and Serveriano Calderon have obtained a concession from the government of this state for the construction of an electric railway to run between Ortiz and the town of Meoqu, a distance of about three miles. The line will also traverse the principal streets of the two terminal towns. It will traverse the rich valley of the Conchos River and will handle freight as well as passengers. D.

BATTLE CREEK, MICH.—The question of building an electric line between this city and Lansing, via Charlotte, is again being agitated, and something of a definite nature concerning this project may be arrived at, at a meeting which will be held in the near future, of those interested. It is authoritatively stated that all the plans for the new road will be completed within the next few months, and active work in the construction started immediately after the plans have been adopted.

BOZEMAN, MONT.—The Gallatin Valley Electric Railway will make one of two extensions this summer, either by building from Bozeman Hot Springs to Three Forks, or running fifteen miles down the banks of the West Gallatin River through Belgrade and on to the north up Dry Creek, according to a statement made by General Manager Charles B. Anderson. That branch will be run for which it is found there is least trouble in getting the right of way. It is hardly thought both branches can be constructed this year.

VALPARAISO, IND.—The survey for the construction of the Gary, Valparaiso and Eastern Electric Railway Company has been completed. The work was done under the direction of F. E. Wilson, engineer for the company, who will also supervise the construction of the line. Work was begun at the court house in Valparaiso, on April 1, by Clair Russell, a Chicago contractor. The road will parallel the Pennsylvania line the greater distance and will pass under the Nickel Plate road east of Wheeler. Senator Hopkins of Illinois and Francis Y. Kaeter are the heaviest stockholders in the enterprise. S.

MADISON, WIS.—At a recent meeting of Madison business men the subject of the interurban line from Merril to Janesville was fully discussed and the construction of the road was sanctioned. J. E. Jones, of Portage, treasurer of the Chicago & Wisconsin Valley Railway Company, which is to build the line, explained the nature of the proposition and stated that the contract to build the road has been let to the Western Indiana Construction Company, which is represented by Allan T. Russell. The matter of granting a franchise for the road will come before the city council soon. The road has been granted a franchise at Portage. M.

ANDERSON, IND.—The Indiana Union Traction Company is in the market for the purchase of rails to double track its system between Muncie and Indianapolis. The Company has purchased over 70,000 creosoted ties to be used over its system during the present year. The new bridge east of this city over White River will be completed in a few days. The plan is to remove the old bridge to Gas City and rebuild it over White River at that point to replace the wooden tructure. The company has other improvements in contemplation and no expense is to be spared to make it one of the best systems in the country. S.

TOLEDO, OHIO.—Ground has been broken for the new improvements of the Toledo Railways and Light Company of this city. Plans call for a large extension at the powerhouse. For this purpose about $300,000 will be expended. Besides the erection of a commodious boiler room and the purchase of additional boilers, the company will invest in a large amount of improved electrical machinery. For the betterment of the system the creditors' committee has authorized the borrowing of $600,000. The improvements are necessary to meet the growing demands for light and power, and for the operation of additional cars. H.

NEW CASTLE, PA.—President Robert M. Russell, of Westminster college, has announced that the New Castle and Mercer trolley line, with a branch to Sharon, is a practical certainty. It will be financed by J. G. White and Company, New York. The concern will be capitalized at $1,000,000 and it is stipulated that $130,000 of the stock be taken by persons living in the territory traversed. Rights of way and franchises have been secured. The company will sell $300,000 of bonds at $90 and $300,000 of the capital stock at $30 to raise funds for the laying of tracks. The rest will be used in equipping a power plant and providing rolling stock.

SPRINGFIELD, MO.—Promoters of the proposed Springfield & Carthage Electric Railway are investigating the Edison storage battery car in view of installing this class of cars on the line from Carthage to Springfield. When completed this line will be as long if not longer than any interurban line in the state and will touch the richest farming and mining land in southwest Missouri. At present Carthage is connected by an electric railway with Girard and Pittsburg, Kans., a distance of seventy-five miles, and when the new line is completed it will connect Springfield with Girard, a distance of 125 miles. The construction work will begin as soon as the weather will permit, and will probably be completed by December.

## TELEPHONE AND TELEGRAPH.

*(Special Correspondence.)*

ADA, MINN.—The Ada Telephone Company will extend its lines to Betcher. C.

BRULE, WIS.—The Brule Telephone Company has been organized by T. W. Jay and others. P.

MOTLEY, MINN.—The Motley Telephone Company has been incorporated with a capital stock of $10,000. P.

MILBANK, S. D.—The Grant County Telephone Company has been organized with Julius Fenner as secretary. P.

HINCKLEY, MINN.—The Hinckley-Kroschel Company is considering the extension of its lines south and west. C.

TOLNA, N. D.—The Sheyenne Telephone Company has applied for a franchise and will reconstruct its whole system. C.

ST. PAUL, MINN.—The Northwestern Telephone Exchange Company will expend $400,000 in improving its system.

MADISON, WIS.—The Ellington Farmers' Telephone Company of Ellington has recently increased its capital stock from $2,000 to $8,000. M.

MILES CITY, MONT.—T. A. Mellinger has asked the city for a franchise for the Montana Independent Telephone Company. P.

BOWBELLS, N. D.—The Foothills Telephone Company has been organized with Wm. Watt, secretary, to construct a rural line along the foothills. C.

JERSEY CITY, N. J.—The General Transmission Company of Jersey City has been incorporated with a capital of $100,000 to transact wireless messages.

TISCH MILLS, WIS.—The County Line Telephone Company

has been organized to serve farmers in Manitowoc and Kewaunee counties. Jose. De Zwarte, secretary. C.

PULASKI, WIS.—The Pulaski Merchants and Farmers Telephone Company has been organized to connect the surrounding towns and rural districts by telephone. C.

SIOUX CITY, IOWA.—The Sergeants Bluff Telephone Company has changed its name to the Woodbury County Telephone Company and increased its capital stock to $100,000.

WINTHROP, MASS.—The New England Telephone and Telegraph Company has purchased a plot of land in Winthrop, upon which it will erect a telephone exchange.

EL CENTRO, CAL.—The Imperial Telephone Company is planning to spend about $20,000 in extension work. A new switchboard will be installed and several new lines constructed.

MIDDLEBURG, PA.—At a recent meeting of the stockholders of the newly organized Middlecreek Telephone Company, the following officers were elected; Hon. Alfred Schoch, president; Geo. W. Wagenseller, secretary and Banks W. Yoder, treasurer.

TIPTON, GA.—A public meeting was held recently at which co-operation was pledged to the Southern Bell Telephone Company in its efforts to establish rural telephone lines throughout the surrounding country, and a committee of citizens was appointed to aid the solicitors of the Bell company in their work. L.

SEYMOUR, IND.—Seymour Home Telephone Company has decided to close its exchange and turn the remnant of its business over to the Mutual Telephone Company. Three years ago the Home Company advanced the rates and the Mutual company was organized as a result. The Independent Long-Distance lines will be connected with the Mutual company's board and the country lines will be taken over by the Mutual company ,bringing about a satisfactory condition in every particular. S.

TOLEDO, OHIO.—At a meeting of the new board of directors, Frank L. Beam, of Mt. Vernon, was elected president of the Ohio Independent Telephone Association, this week. Other officers chosen were: Secretary, H. P. Folson, Circleville; treasurer, R. R. Reamer, Columbus; executive board, S. E. Ward, Mansfield, W. D. Rush, Greenville, H. P. Folsom, Circleville, J. D. Cable, Lima, and C. Y. McVey, Cleveland. The special committee of five which was recently appointed at the annual meeting, is investigating the disparity of toll rates between the Bell lines and The United States Telephone Company, recently purchased by J. P. Morgan & Company, and will report to the board of directors on the matter. H.

## LEGAL NOTES.

LAW SATISFIED BY FIXING OF MAXIMUM RATES.—Assuming a state statute to be mandatory, requiring franchise ordinances to specify the terms upon which electricity, etc., shall be supplied to the municipality and its inhabitants, the supreme court of Indiana says, in Hester vs. Town of Greenwood, 88 N. E. R., 498, that it thinks the requirement sufficiently and fully met by a stipulation as to the maximum rate or charge for the commodity to be furnished. It is manifest that an exact and inflexible rate or price could not be fairly or prudently fixed in advance for a long term of years to come. The fixing of precise rates would almost inevitably defeat the purpose of the law, since, if the rate proved excessive, it would discourage patronage without remedy by adjustment, and, if too low, would compel service at a loss, and in either case result in bankruptcy for the company.

CITY WITHOUT POWER TO FIX MAXIMUM TELEPHONE RATES.—The supreme court of Florida says, in City of Jacksonville vs. Southern Bell Telephone and Telegraph Company, that the charter of the city contains provisions to the effect that the mayor and city council may by ordinance regulate, require and provide for the opening, paving, improving and repairing of any and all streets, and pass all ordinances necessary for the health, convenience and safety of the citizens, and to carry out the full intent and meaning of this act, and to accomplish the objects of this incorporation. The telephone company was operating in the city under an ordinance which contained no condition or provision fixing maximum telephone rates or reserving the power in the city to fix such rates. It is held that under these circumstances the city had no power or authority to pass or enforce an ordinance, subsequent to the one under which the telephone company was operating and using the streets of the city, fixing maximum rates to be charged by the telephone company. Again, the court says that a state statute confers upon municipalities the power to forfeit the franchises, etc., of any street railroad, electric light, telephone, or other company or corporation, under which such company or corporation is using the streets, etc., upon the violation of the terms and conditions of the grant of such privileges, etc., or upon failure to comply with reasonable provision of any ordinance of such municipal corporation regulating the use of the streets by such company or corporation, etc.; but these provisions do not confer upon a municipality the implied power to fix maximum telephone rates to be charged by a telephone company using the streets under an ordinance which contains no reservation of the right to fix such rates. The power to forfeit for failure to comply with the terms of the grant, or for failure to comply with the reasonable provisions of any ordinance regulating the use of the streets, does not, the court thinks, carry with it the implied power to fix maximum rates for telephones. Such a power is clearly outside of the purview of that act.

## ELECTRICAL SECURITIES.

The possibility of demands on the money market, caused by the approach of the April settlements, has had the effect of holding the stock market in restraint for the past week. Throughout, the market was dull and this was reflected by an almost universal drop in the value of electrical securities.

At the annual meeting of the American Light and Traction Company, held in Jersey City, the retiring directors were re-elected.

The Northern Ohio Traction and Light Company reports gross earnings for February of $146,206, a gain of $9,702, and surplus, after interest, $10,401, a gain of $1,830.

Participants in the syndicate which underwrote the $22,000,000 five per cent bonds of the Chicago City and Connecting Railways Company, have been called upon by the managers for payment of about one-third of their subscriptions. These bonds were offered to the public a few weeks ago at ninety-five, but the demand, especially in the West, was not as satisfactory as it had been expected it would be. No attempt is being made at the present time to make a market for the bonds. One of the syndicate members has stated that the undistributed balance would be carried for the interest yield until market conditions were more favorable.

### DIVIDENDS.

Associated Gas and Electric Company, initial preferred dividend of one and one-half per cent, payable April 15.

Bell Telephone of Pennsylvania, quarterly dividend of one and one-half per cent, payable April 15.

Central and South American Telegraph Company, quarterly dividend of one and one-half per cent, payable April 8.

Demerara Electric Company, common dividend of one and one-quarter per cent, payable March 31.

Electric Storage Battery Company, dividend of one per cent from the net earnings of the company on both common and preferred stocks, payable April 1.

Mexican Telegraph Company, quarterly dividend of two and one-half per cent, payable April 15.

National Carbon Company, quarterly dividend of one and one-half per cent, payable April 15.

Westinghouse Electric and Manufacturing Company, preferred quarterly dividend of one and three-quarters per cent, payable April 15.

### NEW YORK.

| | Mch. 28 | Mch. 21 |
|---|---|---|
| Allis-Chalmers common | 10¼ | 11¾ |
| Allis-Chalmers preferred | 38½ | 42¾ |
| Amalgamated Copper | 77¾ | 78⅛ |
| American Tel. & Cable | *80 | *80 |
| American Tel. & Tel. | 140¾ | 141⅛ |
| Brooklyn Rapid Transit | 77⅜ | 75⅛ |
| General Electric | 152 | 154½ |
| Interborough-Metropolitan common | 22⅞ | 21¾ |
| Interborough-Metropolitan preferred | 55½ | 56 |
| Kings County Electric | 129 | 129 |
| Mackay Companies (Postal Telegraph and Cables) common | 88¾ | 89 |
| Mackay Companies (Postal Telegraph and Cables) preferred | 77 | 76 |
| Manhattan Elevated | 136½ | 135¼ |
| Metropolitan Street Railway | 15 | 15 |
| New York & New Jersey Telephone | 123½ | 122 |
| U. S. Steel common | 84½ | 85¼ |
| U. S. Steel preferred | 119⅝ | 121⅛ |
| Western Union | 73¾ | 75 |
| Westinghouse common | 68½ | 70 |
| Westinghouse preferred | 130 | 130 |

*Last price quoted.

### BOSTON.

| | Mch. 28 | Mch. 21 |
|---|---|---|
| American Tel. & Tel. | 140¾ | 141¼ |
| Edison Elec. Illumonating | 255 | 255 |
| General Electric | 152 | 154½ |
| Massachusetts Electric common | 17 | 17½ |
| Massachusetts Electric preferred | 84½ | 83 |
| New England Telephone | 137 | 137 |
| Western Tel. & Tel. Common | 16 | 16 |
| Western Tel. & Tel. preferred | 87 | 88 |

### PHILADELPHIA.

| | Mch. 28 | Mch. 21 |
|---|---|---|
| American Railways | 45 | 45¼ |
| Electric Company of America | 12 | 12 |
| Electric Storage Battery common (ex. dividend) | 61½ | 63 |
| Electric Storage Battery preferred (ex. dividend) | 61½ | 63 |
| Philadelphoa Electric | 15⅞ | 16⅛ |
| Philadelphia Rapid Transit | 22¼ | 22½ |
| Philadelphia Traction | 87 | 87 |
| Union Traction | 49¼ | 49½ |

### CHICAGO.

| | Mch. 28 | Mch. 21 |
|---|---|---|
| Chicago Railways, Seroes 1 | 100 | 104 |
| Chicago Railways, Series 2 | 31 | 31 |
| Chicago Subway | 2¾ | 3 |
| Chicago Telephone | 132¼ | 134 |
| Commonwealth Edison | 116½ | 116½ |
| Metropolitan Elevated common | 16 | 16 |
| Metropolitan Elevated preferred | 51½ | 52 |
| National Carbon common | 114 | 113 |
| National Carbon preferred | 121 | 120 |

## PERSONAL MENTION.

FREDERICK GERHARD, connected with William P. Bonbright & Company, has been appointed secretary of the Guanajuato Power and Electric Company.

JAMES DIXON, formerly sales manager of the General Storage Battery Company, and later associated with its successor, the Westingnouse Storage Battery Company, is now a member of the engineering staff of the Crocker-Wheeler Company at Ampere, N. J.

ROBERT MATHER, chairman of the board of the Westinghouse Electric and Manufacturing Company, sailed for Europe last week on the Mauretania. Mr. Mather expects to be gone about four or five weeks, and will inspect some of the company's European properties.

B. J. FALLON and JAMES WALKER of the Metropolitan West Side Elevated Railway Company of Chicago, were on March 1 promoted to new positions. Mr. Fallon, formerly engineer of maintenance of way, was made assistant manager, and Mr. Walker, who was consulting engineer, became chief engineer.

JACOB LEVIN, superintendent of the southern district of the Western Union Telegraph Company, has resigned and is succeeded by B. F. Dillon, district superintendent at Jacksonville, Fla. Mr. Levin had been in charge of the southern division for several years, having been transferred to Atlanta from Minneapolis.

FRANK MacGOVERN, of the MacGovern-Archer Company, New York, spent a few days in Chicago last week en route to the Pacific Coast where he took over a large portion of the apparatus which had been used by the United Railways Investment Company in its plants prior to the opening of the Stanislaus River power plant.

H. H. JONES, former manager of the Springfield (Ill.) Street Railway, Gas and Electric Company, has recently been appointed manager of the San Diego Gas and Electric Company, of San Diego, Cal. Mr. Jones succeeds C. E. Groesbeck, who has been promoted to district manager of the Pacific Coast plants of H. M. Byllesby & Company.

HARRY G. GLASS.

HARRY G. GLASS, the well known central station man, has accepted a position in the Industrial and Power Sales Department of the Westinghouse Electric and Manufacturing Company. Mr. Glass' time will be devoted to the promotion of the co-operation between the central station and the manufacturer in building up day-loads. His long experience in the central station field and his wide acquaintance with the requirements of central stations well fit him for his new duties. After several years of central station experience he became connected with the Monongahela Valley Electric Company, and had charge of the so-called "Ridinger Plants," consisting of the Monongahela Valley Electric Company, the Donora Light, Heat and Power Company, the Monongahela Electric Company and the Elizabeth Light Heat and Power Company. When these plants were merged and bought out by the West Penn Electrical Company, Mr. Glass was retained in charge as district superintendent. After having held this position three years he was transferred to the general office of the company, located at Connellsville, as assistant to the general superintendent, and later was made superintendent of lighting and power, which position he resigned a year ago to take charge of the electrical department of the H. W. Johns-Manville Company, Pittsburg, Pa.

## PROPOSALS.

NAVY REPARTMENT SUPPLIES.—The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will open bids on naval supplies on the dates given below. Bidders interested therein should make early application for copies of the schedule, giving the schedule numbers desired. Schedules can be obtained from the Navy Pay Office nearest each navy yard. Bids will be asked on the following supplies:

| Date. | Material. | Quantity. | Delivery at navy yard. | Sch. No. |
|---|---|---|---|---|
| April 12—Fan, | convertible steel plate | 1 | Brooklyn, N. Y. | 2357 |
| | Lanterns, combination | 40 | Boston, Mass. | 2354 |
| | Lights, combination oil and electric | 28 | Boston, Mass. | 2354 |
| | Recording watt meters | 18 | Portsmouth, N. H. | 2353 |
| April 19—Boxes, manhole, fuse | | $ | Puget Sd., Wash. | 2359 |
| | Cable, paper insulated | Miscellaneous | Puget Sd., Wash. | 2359 |
| | Cable, rubber insulated | 10,000 feet | Puget Sd., Wash. | 2359 |
| | Compound, insulatong | 120 gallons | Puget Sd., Wash. | 2359 |
| | Motors | $ | Mare Island, Cal. | 2360 |
| | Tape, paper, rubber and gum | 110 pounds | Puget Sd., Wash. | 2359 |
| | Terminals, cable | Miscellaneous | Puget Sd., Wash. | 2359 |
| | Transformers, oil-cooled | 16 | Puget Sd., Wash. | 2359 |
| | Wire, weather-proof | 2,400 pounds | Puget Sd., Wash. | 2359 |

POST OFFICE, NEWNAN, GA.—The office of the Supervising Architect, Washington, D. C., will receive sealed bids until April 29 for the construction, complete (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the Unted States post office at Newnan, Ga., in accordance with drawings and specification, copies of which may be obtained from the custodian of site at Newnan, Ga., or at the Supervising Architect's office.

POST OFFICE, ROCHESTER, MINN.—The office of the Supervising Architect, Washington, D. C., will receive sealed bids until April 26 for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the United States post office at Rochester, Minn., in accordance with the drawings and specification, copies of which may be had from the custodian of site at Rochester, Minn., or at the Supervising Architect's office.

## INDUSTRIAL ITEMS.

RATHBONE & PANIGOT COMPANY, Grand Rapids, Mich., has distributed a catalogue describing its luminous electric open fire places. A number of illustrations show the fire place in detail, and as it appears when installed in a room.

THE HALLER SIGN WORKS, Chicago, Ill., has enclosed with its latest catalogue a number of bulletins showing the latest electric signs. Numerous illustrations show some of the effects that can be obtained with stationary and moving electric signs.

THE WATERBURY COMPANY, New York, N. Y., is mailing price lists of its rubber insulated wire, lamp cord and special wires. The company is also sending a table of freight differentials so that freight rates may be computed for any point in the United States.

ALLIS-CHALMERS COMPANY, Milwaukee, Wis., has received an order from the British Columbia Electric Railway Company for two 2,000-kilowatt, sixty-cycle, three-phase, condensing steam turbo-generator units. These will be used in connection with extension of the service.

THE GENERAL ELECTRIC COMPANY, Schenectady, N. Y., has issued a folder explaining the distinction between ordinary tungsten lamps and the Mazda lamp. Some idea of the co-operative work that is being carried on to develop this lamp may be obtained from a glance at the folder

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia, Pa., announces a change of location of its St. Louis office. The contract agent's office which was in the Wainwright Building, was moved on Monday, March 28, to 1205-6-7, Fullerton Building, Seventh and Pine Streets.

THE WESTERN ELECTRIC COMPANY, Chicago Ill., is distributing bulletin 1,110 descriptive of metal mine telephone sets. The bulletin points out the necessity of having all mines properly equipped with reliable moisture proof telephone sets. A mine signaling set is also illustrated and described.

THE AMERICAN ELECTRICAL HEATER COMPANY, Detroit, Mich., in its catalogue No. 95, shows illustrations of many of its American flat irons, chafing dishes, disc stoves, etc. A novel feature of this catalogue is that it contains not only illustrations of the article itself, but pictures showing the application of each device.

THE RELIANCE ELECTRIC AND ENGINEERING CO., Cleveland O., manufacturers of the well known Lincoln variable speed motor, are having plans drawn for a new plant which will probably be built in a short time. When the new plant is completed it will be a model in every respect and will be used as a showroom for the purpose of exhibiting the Reliance motors.

THE NATIONAL CONDUIT AND CABLE COMPANY, New York, N. Y., states in the March 21 issue of Copper Gossip, that with the coming of spring the expansion of business is noticeable. While the exports of staple products of February had decreased as compared with February of last year, the increase in bank clearings and railroad earnings is encouraging.

THE BODINE ELECTRIC COMPANY, Chicago, Ill., formerly located at 5 West Madison Street, was obliged to seek new quarters at 426 West Madison Street, on account of a fire which destroyed part of the building in which this company had its factory. The present factory is only to be used as temporary quarters until the company can fine more commodious accommodations.

THE DELTA-STAR ELECTRIC COMPANY, Chicago, Ill., is distributing sheets 5 and 6 of its new loose leaf price lists. This list covers the various sizes of connection lugs used in central station and switchboard work. In addition, the technical section contains considerable data on the carrying capacity of conductors and on the heating effects on different materials.

THE MASSACHUSETTS CHEMICAL COMPANY, Walpole, Mass., is putting up a roll of twenty feet of its Walpole brand of tape in a small tin box, under the title "Walpole Junior." These small rolls of tape are made for the convenience of workmen desiring a small quantity of tape in individual package. This tape is identical in quality to that bearing the same brand name and put up in eighty-foot lengths.

THE MOLONEY ELECTRIC COMPANY, St. Louis, Mo., has prepared for advertising purposes a handsome framed lithograph showing its factory and several types of transformers. The con-

struction of the core and coils is also shown; the whole design being united by an artistic scroll-work. The picture, which is about two by three feet in size, is framed in dark wood, making an appropriate and artistic decoration for the wall of an office.

THE NERNST LAMP COMPANY, Pittsburg, Pa., in the March issue of "The Glower," publishes several articles of an interesting nature dealing with installations of Westinghouse Nernst lamps. "The Adaptability of Nernst Lamps" describes an interesting installation in a clothing establishment in Seattle. Another article of interest is an abstract of a paper entitled "Operating Efficiencies of Some Commercial Installations of Lighting Systems" which was read before the Illuminating Engineering Society.

THE LAGONDA MANUFACTURING COMPANY, Springfield, Ohio, has recently published a booklet entitled "The Weinland Quick Repair Head." This booklet is devoted mainly to a discussion of the merits of the new Weinland head which the company has recently brought out and shows how the head can be quickly taken apart and new sharp cutter wheels installed. This catalogue, which is gotten up in pocket size, also gives a brief description of the various other appliances built by the Lagonda Manufacturing Company.

THE LORD MANUFACTURING COMPANY, New York, N. Y., which was, prior to April 1, the Lord Electric Company, announces that it has made arrangements for increasing its factory facilities. New machinery has been purchased and the force more than doubled. Further, the company finds that due to improvements in facilities and the increase in efficiency of the working force, the cost of manufacture has been considerably reduced. This applies to Earll retrievers and catchers, hydrogrounds, lightning arresters, controlators and other products.

THE HAGSTROM BROTHERS, Lindsborg, Kan., are the subjects of a full-page write-up in a recent issue of the *Topeka (Kan.) Daily Capital*. The plant of the Hagstrom Brothers has only come into prominence during the past year, and during this time has had a remarkable growth. At present the demand for their products is so great that it has been necessary to build an extensive addition to their present factory. This company is known as the manufacturer of Hagstrom soot-proof spark plug, Hagstrom's porcelain tube cutter and Hagstrom's electric cord adjuster.

THE JOHN A. STEWART ELECTRIC COMPANY, electrical and steam machinery dealers, has removed its general offices from Fifth and Sycamore, the old location for the past eighteen years, to its new quarters in suite 703, First National Bank Building, Cincinnati, Ohio. The company is also erecting a concrete and steel warehouse and shops on the main line of the Pennsylvania Railroad and the Richmond Division of the same road at Red Bank Station, Cincinnati, to provide for the handling, displacing and overhauling of the larger electrical and steam apparatus.

THE KELLOGG SWITCHBOARD AND SUPPLY COMPANY, Chicago, Ill., has received the contract for the new telephone exchange at Dickenson, N. D. The new switchboard is to consist of two 1,800 line sections with the following equipment. 540 common battery multiple lines, twenty pay station lines and ten toll lines. It is to have three common battery positions and one toll position; also one toll test panel equipped for ten lines. The power equipment will consist of two sets of cells storage battery, one mercury arc rectifier, two Kellogg four frequency pole changers and two sets of transformers in one cabinet. There will be a Monson slate power board to match rectifier. The woodwork of the exchange is to be finished in mahogany and the plant will be a model of exchange arrangement and assembling. The contract was awarded after thorough consideration of the various types of apparatus and is an acknowledgement of Kellogg superiority, both as to details, construction, assembling and operation of apparatus and maintenance. The contract was closed by G. A. Joy, sales engineer.

### DATES AHEAD.

Missouri Electric, Gas, Street Railway and Water Works Association. Next convention, Jefferson City, Mo., April 14, 15 and 16.

Florida Electric Light and Power Association. Next meeting Tampa, Fla., April 21.

Iowa Electric Association and Iowa Street and Interurban Railway Association. Annual convention, Sioux City, Ia., April 21, 22 and 23.

Southwestern Electrical and Gas Association. Annual meeting, Beaumont, Tex., May 10, 1910.

Ohio Mechanical, Electrical and Steam Engineers' Association. Next meeting, Cincinnati, O., May 10.

Oklahoma Public Utilities Association. Next meeting, Sapulpa, Okla., May 9, 10 and 11.

National Electric Light Association. Annual convention, St. Louis, Mo., May 23-28.

Maine Electrical Society. Next meeting, Portland, Me., May 25.

Michigan Electric Associaton. Annual convention, Port Huron, Mich., August 16, 17 and 18.

Colorado Electric Light, Power and Railway Association. Next convention, Glenwood Springs, Colo., Sept. 21, 22 and 23.

# RECORD OF ELECTRICAL PATENTS.

**Issued (United States Patent Office) March 15 and 22, 1910.**

951,789. OZONE-GENERATOR. Frank M. Ashley, New York, N. Y. Filed Feb. 18, 1909. There are two tubular electrodes the ends of which are disposed opposite to each other and at a distance apart greater than the sparking distance therebetween, one of which serves as a conduit for gas.

951,815. DISTRIBUTER. John O. Heinze, Jr., Lowell, Mass. Filed July 29, 1909. Perforated parallel blades are mounted on a distributing shaft of polygonal cross section.

951,821. PORTABLE ELECTRIC-MASSAGING AND LIKE APPARATUS. Nevin B. Le Fevre, London, England. Filed July 27, 1908. Comprises a battery and coil, massaging device, mirrors, handle, etc.

951,825. ATTACHMENT FOR TELEPHONE-MOUTHPIECES. Bert C. Maxwell, Canton, Ohio. Filed Nov. 18, 1908. Renewed September 27, 1909. Has a supplemental mouthpiece adapted to deflect outgoing currents of air away from the person talking.

951,833. CONTROLLING MECHANISM FOR EXPLOSIVE-ENGINES. Walter J. McVicker, Alma, Mich., assignor to Alma Manufacturing Company, Alma, Mich. Filed Aug. 4, 1905. Describes an electric ignition system for internal-combustion engines.

951,844. ANTISEPTIC ATTACHMENT FOR TELEPHONE-MOUTHPIECES. Lucian Rosenwald, Kansas City, Mo., and John H. R. Anthony, Kansas City, Kans.; said Anthony assignor to said Rosenwald. Filed Sept. 16, 1909. The operation of detaching the receiver from the hook switch causes a plug to be lifted out of the transmitter mouthpiece.

951,851. ELECTRIC SWITCH. Frank W. Smith, New York, N. Y. Filed Feb. 25, 1909. Has electromagnetic locking and releasing features.

951,852. ELECTRIC CONTROLLER. Frank W. Smith, Westfield, N. J., and Louis Larsen, New York, N. Y., assignors to Sundh Electric Company. Filed Sept. 30, 1909. A movable contact is caused to break circuit by means of a cam from the action of which the contact may be instantaneously released when desired.

951,864. TELEPHONE-TRANSMITTER. Walter Whitten, Schenectady, N. Y. Filed Aug. 11, 1908. The transmitter comprises a main diaphragm, a plurality of supplementary diaphragms, some of the latter being weighted (the weighted diaphragms being disposed intermediate the other supplementary diaphragms, which are not weighted), and semi-conducting material disposed intermediate the supplementary diaphragms.

951,903. MOTOR FOR CLOCK-MOVEMENTS AND THE LIKE. Sylvanus W. Bramley, Chicago, Ill. Filed June 28, 1909. Describes an electromagnetic device.

951,919. DRIVING MECHANISM FOR PAPER-REFINING ENGINES. Frank E. Saecker, Appleton, Wis. Filed Oct. 18, 1909. Describes a motor-driven mechanism, the motor casing being adjustably supported on the engine bed.

951,955. CABLE-REEL. George E. Lynch, Columbus, Ohio, assignor to The Jeffrey Manufacturing Company. Filed July 8, 1905. Renewed Aug. 15, 1907. Describes a cable-reeling device for an electric locomotive.

915,990. ELECTRODE-PROTECTOR. Herbert C. Harrison, Lockport, N. Y., assignor to Electro Metallurgical Company. Filed June 7, 1909. An electrode for an electric furnace is provided with a protective coating of a salt, which is substantially nonvolatile and chemically inert to the gases above the charge of the furnace.

952,004. THIRD-RAIL ELECTRIC RAILWAY. Isaac L. Edwards, Aurora, Ill. Filed April 13, 1909. A third-rail electric system comprises a live rail, a pair of vertical plates contiguous thereto, separated from each other, a guard and protector having a member fitting between the plates and overhanging the rail, and insulating material interposed between the guard and protector and the plates.

952,024. FIRE-ALARM INTERCOMMUNICATION SYSTEM. Alden D. Wheeler, Hyde Park, Mass.; assignor to The Gamewell Fire Alarm Telegraph Company, New York, N. Y. Filed May 10, 1909. Each station has a multiple-signal transmitting device for controlling the operation of the main circuit.

952,040. REFRIGERATING APPARATUS. Edwin T. W. Hall, Concord, N. H. Filed Nov. 8, 1909.. Has a motor-driven circulating pump.

952,054. SYSTEM OF ELECTRIC SIGNAL OR CONTROL FOR RAILWAY-TRAINS. James T. Thompson, Chicago, Ill. Filed, Feb. 23, 1909. Describes an electric block system.

952,086. ELECTROMAGNET. Samuel P. Thresher, Hartford, Conn. Filed Nov. 6, 1907. The electromagnet is devised so that, as it is energized, the pull on the armature will gradually increase as the armature rotates toward the pole pieces.

952,104. APPARATUS FOR TELEPHONE-LINES. Claude D. Enochs, La Crosse, Wis., assignor to The Vote Berger Company. Filed Feb. 1, 1907. Describes a telephone system.

952,105. MAGNETIC CORE FOR ELECTRIC APPARATUS. Walter C. Fish, Lynn, Mass., assignor to General Electric Company. Filed Jan. 12, 1907. A cylindrical magnetic core for a cylindrical winding is composed of laminas each bent in the form of an involute and only surrounding a portion of the core axis.

952,109. VAPOR-RECTIFIER SYSTEM. Charles M. Green, Lynn, Mass., assignor to General Electric Company. Filed Aug. 11, 1905. Mercury rectifiers having anodes supplied with energy from a number of alternating current sources, separate and independent from the consumption circuit, may be connected in series to supply current to the consumption circuit.

952,113. SYNCHRONOUS MACHINE. Laurence A. Hawkins, Schenectady, N. Y., assignor to General Electric Company. Filed Aug. 5, 1909. A synchronous alternating-current machine has a single armature and a single field magnet, each having coils forming mechanically a single winding but connected in a plurality of circuits and thereby forming electrically two windings of different pole numbers, and means for supplying to two circuits of the field magnet currents relatively variable in amount to induce relatively variable voltages in two armature circuits respectively.

952,123. ELECTRIC TIME-SWITCH. Gottlieb Luthi, Signau, Switzerland. Filed Dec. 17, 1907. A rotatable contact member has a tapering contact surface the edges of which are inclined toward each other.

952,153. CIRCUIT-BREAKER. Percy H. Thomas, Pittsburg, Pa., assignor to Cooper Hewitt Electric Company, New York, N. Y. Filed Dec. 10, 1903. Renewed Feb. 19, 1907. A gas or vapor electric circuit breaker adapted to heat up beyond the conducting point on the passage of normal current through the vapor path comprises means for short-circuiting the vapor path within the container and means for tilting the container to interrupt the short circuit.

952,163. ELECTRICAL INDICATOR. Charles Wirt, Philadelphia, Pa., assignor to Charles Wirt and Company, Newark, N. J. Filed April 24, 1907. A body of molded plastic insulating material has molded in its face a recess to receive the field coil and a segmental recess in which the pointer plays.

952,164. TELEPHONE-TRANSMITTER MOUTHPIECE. Montraville M. Wood, Berwyn, Ill., assignor to W. H. Foll, Freeport, Ill. Filed Dec. 3, 1908. Passageways are provided for the escape of air.

952,165. TELEPHONE-TRANSMITTER MOUTHPIECE. Montraville M. Wood, Berwyn, Ill., assignor to W. H. Foll, Freeport, Ill. Similar and complementary to the preceding.

952,248. METHOD OF OXIDIZING ATMOSPHERIC NITROGEN. Henry Howard, Boston, Mass. Filed June 10, 1907. The method consists in compressing a gaseous mixture containing nitrogen and oxygen, subjecting the same in the compressed state to an electric discharge, then immediately expanding the entire body of highly-heated oxidized product and converting the heat energy into mechanical work, whereby a rapid cooling of the oxidized product is secured and the dissociation of the same is minimized.

952,255. POWER-HAMMER. Corwill Jackson, Denver, Colo., assignor to Northern Electrical Manufacturing Company, Madison, Wis. Filed May 31, 1904. Describes a motor-driven hammer.

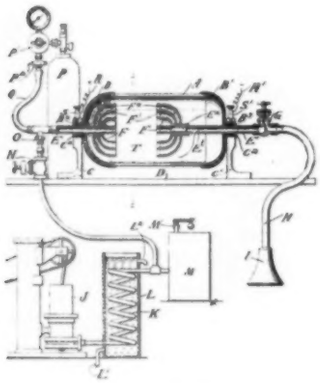
952,267. TELEPHONE-EXCHANGE SYSTEM. Ray H. Manson, Elyria, Ohio, assignor to The Dean Electric Company, Elyria, Ohio. Filed March 28, 1907. In combination with two telephone lines connected together, are a key adapted when actuated to connect a calling generator in circuit, thermic holding and releasing means adapted to engage the key, and means whereby the called subscriber may determine the operation of the holding releasing means.

952,268. ELECTRIC-BATTERY HOLDER. Carl T. Mason, Sumter, S. C. Filed March 12, 1909. An insulating head with vertical openings is provided on its under side with connectors contacting with the exterior electrodes of the cells.

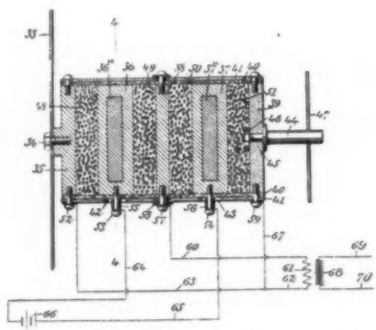
952,276. ELECTRIC-LAMP SOCKET. Johann G. Peterson, Hartford, Conn., assignor to Marshall Electric Company, Hartford, Conn. Filed Dec. 17, 1909. A contact plate for electric switch mechanism, has spring fingers and an insulating disk secured to one face of the plate and provided with notches through which the contact fingers pass.

952,290. HIGH-RESISTANCE IRON ALLOY. Willis R. Whitney, Schenectady, N. Y., assignor to General Electric Company. Filed Jan. 7, 1908. A high-resistance alloy for electrical purposes, consistinng of iron containing 0.2 to 5.0 per cent of boron.

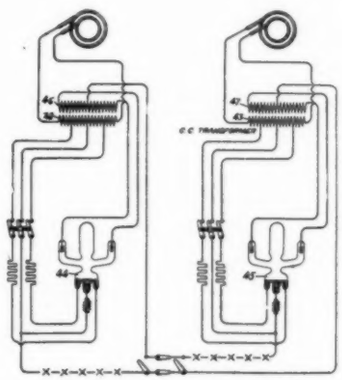
952,332. SYSTEM OF ELECTRICAL DISTRIBUTION. Albert S. Hubbard, Bellevile, N. J., assignor to Gould Storage Battery Company. Filed Aug. 16, 1905. Comprises a main alternating-current generator and an alternating-current distribution cir-



951,789.—OZONE-GENERATOR.



951,864.—TELEPHONE-TRANSMITTER.



952,109.—VAPOR-RECTIFIER SYSTEM.

952,385. ELECTRIC IRON. Frederck Trott, Winnipeg, Manitoba, Canada. Filed June 28, 1909. An electric iron comprises a grooved body portion, independent resistance coils insertible within the grooves and insulated from the body portion, a cover securable to the body portion, contact terminals secured to the cover, and means carried by the cover for electrically connecting the coils in series.

952,403. WIRELESS-TELEGRAPH RECEIVING APPARATUS. Clifford D. Babcock, New York, N. Y., assignor to The United Wireless Telegraph Company, New York, N. Y. Filed Nov. 17, 1909. Comprises a sensitive element, a direct-connected syntonizer, an inductively connected syntonizer, a switch for connecting at will either of the syntonizers, a circuit passing through the sensitive element and connected to the switch, and means for reversing the current through the element.

## REISSUE.

13,095. ELECTRIC-LAMP RECEPTACLE FOR ELECTRIC SIGNS. Frederick W. Ruby, Jackson, Mich., assignor to Ruby Manufacturing Company, Jackson, Mich. Filed Nov. 15, 1909. Original No. 904,728, dated Nov. 24, 1908. A means for supporting electric lamp sockets in structures which are liable to expansion and contraction under the action of temperature changes, comprises a member introducible between the socket and the main supporting structure, this member being yieldable to the temperature-produced movements of the main structure and thereby relieving the lamp sockets from the strains of such movements.

(PATENTS ISSUED MARCH 22.)

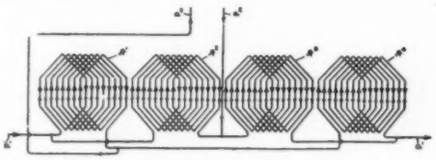
952,448. INSULATING-BUSHING. Samuel M. Kintner, Pittsburg, Pa., assignor, by mesne assignments, to Westinghouse Electric and Manufacturing Company, East Pittsburg, Pa. Filed August

8, 1908. An insulating medium comprises layers of insulating and conducting materials, and round rod or wire conductors into which the exposed ends of the conducting layers are merged.

952,455. CLEANER FOR SHIPS' HULLS AND THE LIKE. William R. Macdonald, London, England. Filed January 27, 1908. Renewed February 11, 1910. An apparatus for cleaning submarine iron surfaces comprises a plurality of battens with flexible connections between them, a plurality of brushes secured to the battens, and a plurality of electromagnets secured to several of the battens. The electromagnets and brushes face the same way, and the brushes have bristles of a greater length in the middle than outside, so as to present a convex surface.

952,458. OSCILLATING ELECTRIC FAN. Charles R. Meston and Herbert I. Finch, St. Louis, Mo., assignors to Emerson Electric Manufacturing Company, St. Louis, Mo. Filed April 23, 1909. In combination with a fan base are: a motor-housing pivotally mounted in the base, a post mounted on the motor-housing, constituting a rock shaft, arms carried by the post and links connected to the arms, one of the links being connected to the base and the other to a driving member actuated by the armature shaft of the motor.

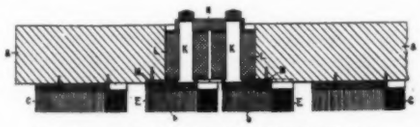
952,467. INSULATING MATERIAL. Arthur B. Reynders, Wilkinsburg, Pa., assignor to Westinghouse Electric and Manufacturing Company, East Pittsburg, Pa. Filed July 6, 1908. An insulating structure comprises alternate layers of insulating material and conducting material which constitute a series of condensers, the insulating layers being graded as to specific inductive capacity in accordance with their distances from the surfaces of the structure.



952,113.—SYNCHRONOUS MACHINE.

952,494. RAILWAY-CAR CONTROL APPARATUS. John B. Atwood, Allegheny, Pa. Filed December 9, 1907. A track brake has electric means for controlling it. The car itself makes the electric circuit.

952,513. INSULATING MATERIAL. James C. Dow, Wilkinsburg, Pa., assignor to Westinghouse Electric and Manufacturing Company. Filey July 5, 1907. An insulating bushing comprises a plurality of continuous convolutions of suitable in-



952,455.—CLEANER FOR SHIPS' HULL.

sulating material, and separate convolutions of conducting material interposed in a bushing at intervals.

952,521. SUPPORTING-BRACKET FOR ELECTRIC LIGHTS. John P. Hebendahl, Elizabeth, N. J. Filed October 11, 1909. A bracket comprises a casing, a pulley in the casing, a restraining means in the casing, a flexible strand passing over the pulley, a supporting means on the end of the strand adapted to be seated in the restraining means, and means for varying the distance between the pulley and the restraining means.

952,532. ALTERNATING-CURRENT MOTOR. Waldo A. Layman, Webster Groves, Mo. Filed July 29, 1909. Comprises a stator, a main inducing winding on the stator, a rotor, commuted winding on the rotor short-circuited by means of brushes along an axis displaced from that of the main inducing winding, means for short-circuiting a number of points of the commuted winding after a certain speed has been reached, a second commuted winding on the rotor connected in series relation to the main inducing winding, and means for impressing a compensating electromotive force on the second commuted winding.

952,557. TELEPHONE-MOUTHPIECE. Alfred K. Young, Pittsburg, Pa. Filed Aug. 4, 1909. Has an antiseptic container.

952,561. HIGH-TENSION MAGNETO-GENERATOR. Edouard Denieport, Paris, France, assignor to Societe Anonyme des Appareils Electriques Nieuport, Suresnes, France. Filed May 23, 1908. An annular condenser connected with opposite contacts of a circuit breaker for the primary winding of the armature, is carried by and surrounds a portion of the armature shaft.

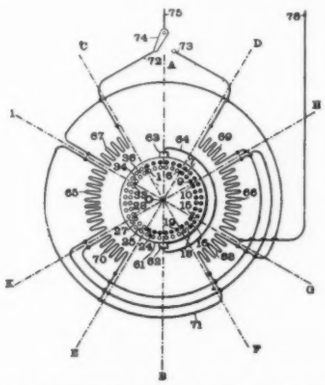
952,566. ALTERNATING-CURRENT MOTOR. Valere A. Fynn, London, England, assignor to Wagner Electric Manufacturing Company, St. Louis, Mo. Filed June 1, 1909. The rotor is provided with a fractional pole pitch winding short-circuited by means of brushes along a stationary axis; the stator is provided with a main winding and two auxiliary windings adapted to co-operate with the main winding, the sum of the arcs spanned by the main aud apxiliary windings corresponding to the sum of the arcs spanned by the active rotor conductors; and means are provided for cutting one or the other of the auxilliary windings out of effective operation.

952,567. TELEPHONE SYSTEM. David S. Hulfish, Chicago, Ill., assignor to McMeen & Miller, Chicago, Ill. Filed March 7, 1907. There are switching devices for interconnecting the lines, and tone test devices are connected normally with the answering equipment of the switching devices whereby the test received from a tested line through the connecting terminal of a switching device may disclose to some degree the identity of the switching device then associated through answering equipment with the tested line.

952,650. INDUCTIVE MOTOR-CONTROLLING APPARATUS. August Sundh, Yonkers, N. Y., assignor to Otis Elevator Company, Jersey City, N. J. Filed July 17, 1907. A motor-control system comprises a motor having differential field windings, means to gradually vary the current in the windings and operate the motor and means operated by the motor to oppose the effect of the first-named means.

952,681. AUTOMATIC MECHANICAL CUT-OFF FOR ELECTRICAL HEATING APPLIANCES. William B. Matheson and Isidore D. Brodek, Los Angeles, Cal. Filed Jan. 13, 1909. An electric iron is provided with a current-regulating switch.

952,692. SPARK-COIL. Chester H. Thordarson, Chicago, Ill. Filed Nov. 17, 1908. Comprises a cast-iron base, an inverted cup-shaped cast-iron casing supported thereon, a laminated core independent of the base and casing, but contacting at one end with the inner end surface of the inverted cup-shaped



952,566.—ALTERNATING-CURRENT MOTOR.

casing and resting at its other end upon the base, an insulating sheet interposed between the core and base a heavy low-resistance conductor coil surrounding the core, and circuit terminals for the coil through the casing.

952,698. MEANS FOR OPERATING ELEVATOR-DOOR LOCKS. John E. Boyce, New York, N. Y., assignor to Otis Elevator Company, Jersey City, N. J. Filed July 11, 1905. Electrical connections are provided whereby the door lock is brought to unlocking position only when the car is opposite the door.

952,710. ALARM APPARATUS. Frank Pesce, Jersey City, N. J. Filed Aug. 3, 1909. Includes an electric bell or buzzer automatically operated at predetermined intervals.

952,741. TESTING SET. Charles A. Hoxie, Schenectady, N. Y. Filed April 19, 1909. Comprises a telephone receiver, a source for supplying current thereto, contacts in the path of the current, means for shunting the contacts at will, and a local circuit including a buzzer, the latter having means rapidly and periodically closing the contacts to establish unidirectional current pulsations in the telephone receiver.

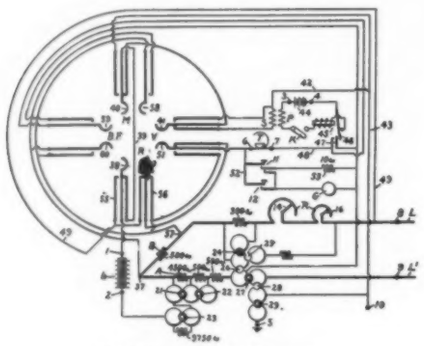
952,760. ELECTRIC IGNITER FOR EXPLOSIVE SHELLS. Paul Schwenke, Zerbst, Germany. Filed July 23, 1908. The igniter operates on touching water.

952,778. ELECTRICALLY-OPERATED MEANS FOR PRODUCING MECHANICAL MOVEMENTS. Maurice J. Wohl, New York, and Harry Hertzberg, Brooklyn, N. Y., assignors to Abbott A. Low, Horseshoe, N. Y., Maurice J. Wohl, New York, N. Y., and Harry Hertzberg, Brooklyn, N. Y., trustees. Filed March 20, 1908. A mechanical movement comprises a driven rotary member, an oscillatory member, means for transmitting

the movement of the oscillatory member to the rotary member, a plurality of thermal expansible members arranged in pairs in which the direction of pull is in opposite directions, each pair being operatvely connected to the oscillatory member and electrically connected to operate simultaneously to acute the oscillatory member, and means for passing a heating current simultaneously and intermittently through the thermal members.

952,855. THERMOSTATIC DAMPER-REGULATING APPARATUS. Benjamin C. Wickes, Auburn, N. Y. Filed March 18, 1908. Connections are provided between a thermostatic device and a motor for moving dampers into closed draft position.

952,899. INDUCTANCE-NEUTRALIZING COIL-WOUND CORE AND COMMUTATING IMPEDANCE-COIL FOR ELECTRIC MACHINES. Winder E. Goldsborough, La Fayette, Ind. Filed Dec. 22, 1902. An electric commutating machine comprises a

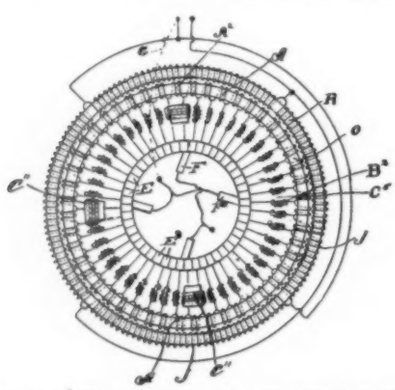


952,741.—TESTING SET.

commutator, induction coils connected in series with the commutator leads of the armature coils, and short-circuited core-wound coils adapted to be placed in inductive relation to the induction coils.

952,941. ELECTRIC HEATER AND COOKING APPARATUS. Frank C. Perkins, Buffalo, N. Y. Filed May 10, 1909. An electric heater comprises a cylindrical non-combustible base, a non-combustible reflecting collar arranged on the base, a lamp arranged in center of the collar, and a metal heat-absorbing shell surrounding the lamp directly.

952,944. APPARATUS FOR TRANSMITTING SIGNALS OVER TELEGRAPHIC CIRCUITS. Louis M. Potts, Baltimore, Md.,



952,899.—CORE AND IMPEDANCE COIL FOR ELECTRIC MACHINES.

assignor to The Rowland Telegraphic Company. Original application filed Jan. 25, 1908. Divided and this application filed June 5, 1908. A telegraphic apparatus comprises a plurality of sources of alternating half-waves of current, a commutator, and means directly connecting the sources of current to the commutator and adapted to cause one of the sources to send only modified or reversed half-waves to line.

952,952. ATTACHMENT-PLUG. Frank E. Seeley, Bridgeport, Conn. Filed April 13, 1907. An inclosed fuse is held between clips.

952,953. ELECTRIC-TIME-SWITCH MECHANISM. A. B. Shaw, West Medford, Mass. Filed May 1, 1909. Comprises a time mechanism, a spring motor, an electric switch, means connecting the spring motor and electric switch, a pair of levers pivoted at one end for preventing the movement of said means and the unwinding of the motor, and a pair of revoluble retaining rings within and by which the free ends of the levers are normally held and the rings operated by the time mechanism for controlling the movement of the levers.

952,961. ELECTRICAL PLUG-RECEPTACLE. George B. Thomas, Bridgeport, Conn., assignor to The Bryant Electric Company, Bridgeport, Conn. Filed Sept. 9, 1909. A plug receptacle has an insulating body with a hole through it and a metal contact tube in the hole engaging the body to prevent the free passage of the tube through or its rotation in the hole.

952,978. ELECTRIC VACUUM MILKING MACHINE. George B. Cramp, Duquesne, Pa. Filed June 17, 1909. Magnetically operated valves are controlled by the flow of milk for shutting off the vacuum from the cups.

952,995. ELECTRIC LAMP. Henry N. Potter, New Rochelle, N. Y., assignor to Nernst Lamp Company, Pittsburg, Pa. Filed Aug. 3, 1903. The globe has a bottom opening and a double reflector having peripheral projections between which is clamped the edge of the globe which bounds the opening.

953,006. AUTOMATIC CONTROLLING-SWITCH FOR ELECTRIC MOTORS. Richard L. Guion and Burchard C. Johnson, Elmira, N. Y., assignors to American Thermostat Company, Elmira, N. Y. Filed Nov. 9, 1908. Includes an electric motor having a reversible circuit controlled by a circuit-closing device, a switch in the circuit adapted to be actuated when the motor has completed a given number of revolutions in either direction to shift the circuit for the reversal of the motor, and means actuated by the closing of the circuit in either direction for short-circuiting the respective connections leading to the circuit closing device.

## PATENTS THAT HAVE EXPIRED.

Following is a list of the electrical patents (issued by the United States Patent Office) that expired March 28, 1910.

494,149 and 494,150. PROCESS OF MANUFACTURING FILAMENTS FOR INCANDESCENT LAMPS. Alexander DeLodyguine, Paris, France.

494,151. FILAMENT FOR INCANDESCENT LAMPS. Alexander DeLodyguine, Paris, France.

494,185. PRINTING-TELEGRAPH. John E. Wright, New York, N. Y.

494,199. PYROELECTRIC BATTERY. Thurston G. Hall, Chicago, Ill.

494,225. ELECTRICAL METER. Gustaf Rennerfelt, Buffalo, N. Y.

494,239. ELECTRICAL EXCITATION OF VACUUM-TUBES. Harry T. Barnett, London, England.

494,258. STOP-MOTION FOR KNITTING-MACHINES. George J. Manderfield, Royersford, Pa.

494,278. ELECTRIC BELL. Frederick W. Manager and Otto H. Huebel, Brooklyn, N. Y.

494,279. CIRCUIT OF ELECTRIC SIGNALING. Morris Martin, Malden, Mass.

494,281. ELECTRIC-CAR FENDER. Edwin Rochester, Ottawa, Canada.

494,291. ELECTRIC HEATING APPARATUS. Mark W. Dewey, Syracuse, N. Y.

494,295. INDUCTION SYSTEM OF ELECTRICAL HEATING. Samuel B. Jenkins, Boston, Mass.

494,301. ELECRICALLY-HEATED RADIATOR. Willis Mitchell, Malden, Mass.

494,337. ELECTRIC ANNUNCIATING PUSH-BUTTON. John King, Chicago, Ill.

494,344. CONTROLLING DEVICE FOR ELECTRIC CARS. James H. Neal, Boston, Mass.

494,345. ELECTRIC SIGNALING APPARATUS. Frederick Pearce, New York, N. Y.

494,359. ELECTRIC BRUSH. Robert E. Williams, Hot Springs, Ark.

494,385. TELEPHONE AND SIGNALLING CIRCUIT. Frank A. Pickernell, Newark, N. J.

494,451. ELECTRICAL SWITCH-LOCK. Frederick C. Weir and Edward W. Harden, Cincinnati, Ohio.

494,477. ELECTRIC RAILWAY. John C. Henry, New York, N. Y.

494,479. ELECTRIC-CAR TRUCK. John C. Henry, New York, N. Y.

494,489. ELECTRIC SIGNAL, SWITCH MOVING, AND INTERLOCKING MECHANISM. Joseph Ramsey, Jr., and Edward W. Harden, Cincinnati, Ohio.

494,495. ELECTRIC BOLT-OPERATING MECHANISM FOR SAFES. Emory Stockwell and Herbert C. Stockwell, Stamford, Conn.

494,499. GLOBE-HOLDER FOR ELECTRIC-ARC LAMPS. William A. Turbayne, Detroit, Mich.

494,513. ALTERNATING-CURRENT METER. William Stanley, Jr., Pittsfield, Mass.

494,520. ELECTRICAL INSTRUMENT FOR MEDICAL PURPOSES. Benjamin Y. Boyd, Wichita, Kans.

494,531. ELECTRIC-LAMP VIBRATOR-REGULATOR. Daniel M. Moore, New York, N. Y.